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Photo by article co-author Chelsea Rozanski and used with permission under CC BY 4.0

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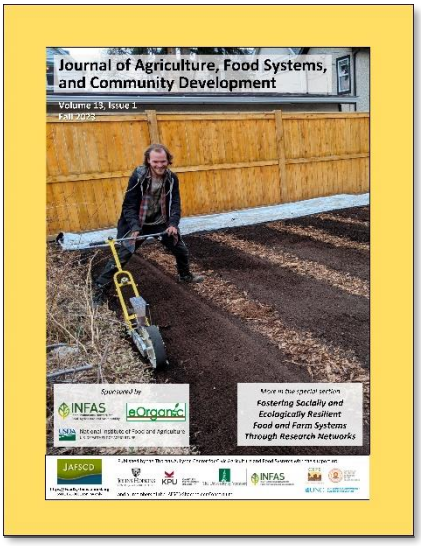
In This Issue
Duncan Hilchey

Organic research networks and more!



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This fall 2023 issue of JAFSCD (volume 13, issue 1) includes open-call papers on a wide range of topics spanning the three main domains of a food system: production, marketing, and consumption. It also includes additional articles in response to our special call for papers on "Fostering Socially and Ecologically Resilient Food and Farm Systems Through Research Networks," sponsored by INFAS, eOrganic, and USDA National Institute for Food and Agriculture.

On our cover we see Michael Gavin, owner and operator of Root and Regenerate Urban Farms, using a seeder to plant a spring crop in one of the SPIN (Small plot IN-tensive) back yard plots in Calgary, Alberta, Canada. He collaborated with co-author Chelsea Rozanski, who is Ph.D. candidate in anthropology at the University of Calgary, on the article in this issue mentioned below.

We begin the issue with John Ikerd's Economic Pamphleteer column. In this first in a new series of columns he has titled "Perspectives on Agriculture, Food Systems, and Communities," Ikerd calls for reforms requiring "changes in culture that prioritize resourcefulness, resilience, and regeneration over extraction, exploitation, and extermination." I have more to say about John's new series at the end of this editorial.

We follow the column with a number of commentaries and a Voices from the Grassroots essay. In our first commentary, *Nutrition education centers: A community-based approach to management of malnutrition*, **Samuel Ikendi, Francis Owusu, Dorothy Masinde, Ann Oberhauser,** and **Carmen Bain** share details about a

On our cover: Farm owner (and article co-author) Michael Gavin uses a seeder to plant a spring crop in one of the SPIN (Small plot IN-tensive) back-yard plots in Calgary, Alberta, Canada. See more in the article in this issue, Growing in relation with the land: Experiential learning of Root and Regenerate Urban Farms.

Photo by article co-author Chelsea Rozanski and used with permission

unique and successful capacity-building program in Uganda that provides comprehensive support for families in need.

In the commentary that follows, **Ishwari Singh Bisht** explores the role of agroecology-based community kitchens and culinary agri-ecotourism in *Engaging rural youth in strengthening the local food movement in India*.

In *Assessing food systems funders' use of data and evidence to make funding decisions,* **Lesli Hoey, Lilly Fink Shapiro, Catherine Diggs, Duncan Hilchey, Kim Hines,** and **Fally Masambuka-Kanchewa** share results of their survey of a sample of foundations regarding their use of JAFSCD content and other sources of factual information.

In our final commentary for this issue, **Philippe Jeanneaux** presents an example of how one group of disparate onion growers could change their stars in *Toward a more profitable value chain for New York state onions*.

Next, in their Voices from the Grassroots essay, *Examining the history of trust within Appalachian coal camps,* **Angel Smothers, Kristen Goins, Tanner Cole, Jaylyne Morgan, Erin Young,** and **Kylie Young** provide a fascinating look into the unique food security challenges of an American rural food desert.

In our ongoing special topic call for papers on "Fostering Socially and Ecologically Resilient Food and Farm Systems Through Research Networks," we have two new papers: first, **Chelsea Rozanski** and **Michael Gavin** present a reflective essay featuring their work utilizing SPIN farming in *Growing in relation with the land: Experiential learning of Root and Regenerate Urban Farms*.

Next up in the special section, in *The evolution of a partnership-based breeding program for organic corn,* **Walter A. Goldstein** presents a case study of the advent of a bottom-up approach to developing an organic corn variety that has competitive yield, better nutritional value, and environmental benefits—and is not patented.

Our open-call papers then delve into a broad range of food systems-based community development. **David Conner, Claire Whitehouse, Neishaly Serrano-Cortés, Robinson Rodríguez-Pérez, Naomi Cunningham, Travis Reynolds, Kerry Daigle, Valery Desravin,** and **Jane Kolodinsky** proffer an asset mapping exercise that utilizes the community capitals framework in *Food Resilience Toolkit in action*.

In *Developing a food system indicators database to facilitate local food systems assessments: Using a scoping review approach*, **Abiodun T. Atoloye, Sophie Schouboe, Caitlin Misiaszek, Jamie Harding, Kristen Cooksey Stowers, Karen Bassarab,** and **Larissa Calancie** present a set of metrics for use by food policy councils (FPCs) to measure progress in the local food system over time.

Then, *Exploring the implications of the Fair Trade USA certification for farmworker health and well-being at the first certified farm in the U.S.*, by **Alissa Bilfield** and **Edmundo Hernandez**, provides a first look at the impacts of a global north fair trade program.

Lianna Gomori-Ruben and **Chantal D. Reid** next present their use of the FAO's "Tool for Agroecology Performance Evaluation" to find that a sample of female operators in the United States generally tended to be ecological in their farming practices in their article, *Using TAPE to assess agroecology on women-led farms in the U.S.: Support for environmental and social practices*.

In *Peasants' land rights and the hollowing out of communal property management in rural China*, **Xiaoyu Yu** discovers that China's land privatization policy has not fulfilled in its intended outcomes.

In *More than procurement: Examination of a farm-to-early-care and education pilot*, **Meagan K. Shedd** and **Rachel Kelly** present a case study of a farm-to-ECE procurement pilot program that features purchasing, gardening, and nutrition and education practices.

Next, **Sheridan Rabbitt, Ian Lilley, Simon Albert, Joelle Albert,** and **Ian Tibbetts** explore the tension between human nutritional needs and environmental limitations in *The importance of nutrition-sensitive fisheries management: Women's dietary diversity in Marovo Lagoon, Solomon Islands*.

In *A feasibility evaluation of the community health worker model for garden-based food systems programming*, **Maria DeNunzio, Elena Serrano, Vivica Kraak, Melissa Chase,** and **Sarah Misyak** conclude that with the proper fit, cultural humility, and logistics, utilizing trained lay public health workers can be effective in garden-based program delivery.

Samuel Ikendi, Francis Owusu, Dorothy Masinde, Ann M. Oberhauser, and **Carmen Bain** then

report the results of their extensive evaluation of a unique development strategy in *Does participation in livelihood education programs impact household food security? A comparative study in rural Uganda*.

In *Northeastern bakers' views on organic and regeneratively certified flours*, **Karen Hiniker Simons** presents the results of a survey of bakers in the Northeast U.S., revealing the challenges of purchasing, utilizing, and selling produces with environmentally responsible ingredients.

This is followed by a set of papers focused on community food security. In *Non-market distribution serves society in ways markets cannot: A tentative defense of food charity from small-town New England*, **Sam Bliss, Ava Hill, Alexandra Bramsen, Raven Graziano, Saharay Perez Sahagun,** and **Flora Krivak-Tetley** show that distributing food for free strengthens relationships, fosters resilience, puts edible-but-not-sellable food to use, and aligns with an alternative, non-market vision of a desirable food future.

In *Nourishing student success and wellbeing: Unveiling the impact of food environments on student food security challenges through a case study from Montana*, **Teresa Warne, Roland Ebel,** and **Selena Ahmed** look at environmental factors contributing to food insecurity at U.S. colleges and universities.

Sara McPhee-Knowles and **David Gatensby** next find there's no one-size-fits-all approach to solving hunger in *Food insecurity in Yukon communities during COVID-19: A qualitative study*.

Finally, we share one book review. In her review entitled "The *spia* who loved food," **Natasha Bernstein Bunzl** provides a critique of Valeria Siniscalch's *Slow Food: The Economy and Politics of a Global Movement*.

I want to wrap up my editorial with a few words about **Professor Emeritus John Ikerd**. He has contributed "Economic Pamphleteer" columns to the *Journal of Agriculture, Food Systems, and Community Development* since its inaugural issue in 2010. His columns have provided economic perspectives on a wide variety of agricultural, food systems, and community development issues. He offers a perspective that comes from someone who has lived through the transition from small, independent family farms, local food systems, and vibrant rural and urban communities to a corporately controlled agriculture, a global food system, and economically and socially desolate rural and urban communities. His point of view is informed by spending the first half of his 30-year academic career as an advocate for the extractive, exploitative system of economic development that brought about these changes—and in the years since as one of its most outspoken critics. He has been a relentless advocate for sustainable family farms, community-based food systems, and an economic and social renaissance of rural and urban communities.

In his next few columns, John will continue to share his unique perspectives on changes in farms, foods, and communities over the past 70 years, and why understanding the past is relevant in planning and preparing for the future.

Stay tuned for more of his thoughtful and razor-sharp columns!

Wishing you happy holidays with friends and loved ones,

Duncan Hilchey
Publisher and editor-in-chief

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The Economic Pamphleteer
John Ikerd

A new series of Economic Pamphleteer columns:
Perspectives on Agriculture, Food Systems, and Communities

Sustainability: The defining question of the 21st century

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John Ikerd has contributed "Economic Pamphleteer" columns to the *Journal of Agriculture, Food Systems, and Community Development* since its inaugural issue in 2010. His columns have provided economic perspectives on a wide variety of agricultural, food systems, and community development issues. He provides a perspective that comes from someone who has lived through the transition from small, independent family farms, local food systems, and vibrant rural and urban communities to a corporately controlled agriculture, a global food system, and economic and socially desolate rural and urban communities.

His perspectives are also informed by spending the first half of his 30-year academic career as an advocate for the extractive, exploitative system of economic development that brought about these changes and in the years since as one of its most outspoken critics. He has been a relentless advocate for sustainable family farms, community-based food systems, and an economic and social renaissance of rural and urban communities. The next several columns will focus on John's unique perspectives on changes in farms, foods, and communities over the past 70 years and why understanding the past is relevant in planning and preparing for the future.

My purpose in sharing my long-run perspectives on farms, foods, and communities is not to dwell on the past—neither what was nor what could have been. The past is important only in so far as it helps us understand the realities of the present and possibilities for the future. There is a basic tendency for everything on earth to operate in cycles—physical, chemical, biological, economic,

John Ikerd is professor emeritus of agricultural economics, University of Missouri, Columbia. He was raised on a small farm and received his B.S., M.S., and Ph.D. degrees from the University of Missouri. He worked in the private industry prior to his 30-year academic career at North Carolina State University, Oklahoma State University, the University of Georgia, and the University of Missouri. Since retiring in 2000, he spends most of his time writing and speaking on issues of sustainability. Ikerd is author of six books and numerous professional papers, which are available at https://ikerdj.mufaculty.umsystem.edu and http://johnikerd.com.

*Why an **Economic Pamphleteer?** In his historic pamphlet* Common Sense, *written in 1775–1776, Thomas Paine wrote of the necessity of people to form governments to moderate their individual self-interest. In our government today, the pursuit of economic self-interest reigns supreme. Rural America has been recolonized, economically, by corporate industrial agriculture. I hope my "pamphlets" will help awaken Americans to a new revolution—to create a sustainable agri-food economy, revitalize rural communities, and reclaim our democracy. The collected Economic Pamphleteer columns (2010–2017) are available at https://bit.ly/ikerd-collection*

and social. Life on Earth is made possible by the biological recycling of finite quantities of chemical elements. Even the universe is thought to be circular so that if we traveled far enough in one direction we would eventually return to where we started. Whatever goes around eventually comes back around. So, the past provides potentially valuable insights into the future.

The biological, social, and economic cycles we experience directly are most relevant to the future of agriculture, food systems, and communities. This is not the first time that control of the land has been concentrated among a few powerful landlords, that people have become dependent on distant sources of food, or that communities have disbanded and dispersed. The early American agricultural plantations and the collective farms in the former Soviet Union were not sustainable. Neither were the great Incan cities of Peru and Bolivia in earlier times. These past trends were not sustainable—they couldn't continue. They all eventually stalled out and returned to decentralized ownership or control of land, local control of food production and distribution, and communities of necessity if not communities of choice.

Reality is ever-evolving, and cyclical changes never recreate the same physical, biological, or social structures and processes that characterized previous cycles. However, the same principles and patterns that dominate specific phases of cycles tend to be repeated cycle after cycle. The dominant principles and patterns of our current systems of farming, food production, and community development are basically the same as those of unsustainable systems of the past. The odds are great that farms, food systems, and communities of the future will have far more in common with those of 50 to 70 years ago than with those of today. This does not mean we are going back to the past; this is simply the way that the unfolding of reality has always moved forward or evolved.

How can we create a regenerative, resilient, resourceful food system capable of meeting the basic human needs of all indefinitely into the future? I believe this is the defining question of the 21st century.

I understand and accept that the word "sustainable" has been so intentionally confused, abused, and misused by defenders of the unsustainable status quo that it has been abandoned by most early advocates. However, I still believe that future changes in the agri-food system, the economy, and society in general will be driven by the question of sustainability: How can we meet the basic needs of all in the present while preserving equal or better opportunities for those of the future? As I have written in previous columns, the true meaning of the word sustainable and of the *authentic* sustainability movement is clearly understood by its opponents as well as its advocates (Ikerd, 2021). The confusion has been carefully crafted as a distraction.

In the simplest terms, if something we are doing is sustainable, we can continue doing it indefinitely into the future, essentially forever. Some critics who claim that sustainability is not enough are essentially arguing that what we are currently doing is not good enough. They fail to acknowledge that if the current situation is not good enough—which it is not—then it is not sustainable. In other words, sustainability is not about maintaining the status quo. The status quo is not sustainable. If we who have plenty are unwilling to secure the basic needs of all today, how can we possibly rationalize asking those in need today to sacrifice further so that we may have even more in the future? The late Robert Rodale used to refer to sustainability as *the big question*. How can we create a regenerative, resilient, resourceful food system capable of meeting the basic human needs of all indefinitely into the future? Again, I believe this is the defining question of the 21st century.

As a society, we clearly understand the meaning of "unsustainable." When I first became involved with the sustainability movement in the late 1980s, the term was unfamiliar to most people. Today, one of the most familiar phrases in the

English language is that something is "not sustainable." It seems to be generally recognized that societies that rely on fossil energy are not sustainable, political systems dominated by multinational corporations are not sustainable, the growing political divisiveness within democracies is not sustainable, the cultural and socioeconomic divisiveness between rich and poor people within and among nations is not sustainable, the extractive, exploitative systems of neoliberal economic development are not sustainable, and the current corporately controlled industrial agri-food system is not sustainable.

As a society, we know that virtually every critical aspect of our so-called modern society is unsustainable. Yet we go about our activities, day after day, as if we could simply keep doing what we are doing now, and have been doing for the past 40 or more years, essentially forever. We are unwilling to even consider the fundamental changes in our economic and political systems that will be essential for creating a sustainable society, economy, or agri-food system.

In the next few columns, I plan to share my perspective on the emergence, progression, and significance of specific issues related to agri-food sustainability. Organic, biodynamic, and, now, regenerative farming movements are all driven by the quest for agricultural sustainability. Permaculture, holistic management, and agroecology are all attempts to create sustainable agroecosystems. Relocalization, bioregionalism, and food sovereignty are all strategies to create sustainable communities.

I also plan columns focused on the means of addressing the current lack of sustainability, including reforms in farm and food policies and the use of public utilities to secure local food sovereignty and economic sustainability. These reforms will require changes in culture that prioritize resourcefulness, resilience, and regeneration over extraction, exploitation, and extermination. I plan to focus on the critical role that people in local communities must play in initiating and nurturing local cultures of caring, cooperation, and collaboration that are sufficiently successful to spread to national and global levels of organization.

Reforms will require changes in culture that prioritize resourcefulness, resilience, and regeneration over extraction, exploitation, and extermination.

It really doesn't matter to me personally what we ultimately call sustainable farms, food systems, or communities of the future—as long as they have the ability to meet the needs of all in the present while leaving equal or better opportunities for those of the future. Organizations that lose sight of, ignore, or fail to understand that a lack of sustainability has been driving all of the major progressive social movements of the past hundred years will likely contribute more to the problem than to the solution. Thus, my perspectives on the past and future of agriculture, food systems, and communities will be presented from the perspective of concern for agricultural, economic, and societal sustainability.

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COMMENTARY

Nutrition education centers: A community-based approach to management of malnutrition

Samuel Ikendi,[a] * Francis Owusu,[b] Dorothy Masinde,[c]
Ann Oberhauser,[d] and Carmen Bain [e]
Iowa State University

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Introduction

Nutritional health is a core aspect of sustainable development. Globally, progress has been made in reducing child stunting and promoting exclusive breastfeeding; nevertheless, anemia, malnourishment of mothers and children, and general food insecurity are still persistent, requiring multifaceted approaches to address those challenges (Food and Agriculture Organization of the United Nations [FAO] et al., 2022). Uganda, the location of this case study, adopted both global and regional strategies. For example, Uganda is a signatory to the United Nations Sustainable Development Goals (SDGs) targeting an end to all forms of malnutrition by 2030 (United Nations, 2015). Regionally, Uganda is also a signatory to the 2014 Malabo Declaration, which aimed at enhancing

[a] * *Corresponding author*: Samuel Ikendi, Master's candidate, Community and Regional Planning, co-major with Sustainable Agriculture, Iowa State University. Samuel is now a doctoral graduate of Agricultural Extension Education, Iowa State University and is an Academic Coordinator for the USDA NIFA-funded Climate Smart Agriculture Project, Agriculture and Natural Resources, University of California; 5200 North Lake Road; Merced, CA 95343 USA; +1-209-228-4400; sikendi@ucanr.edu

[b] Francis Owusu, Professor and Chair, Department of Community and Regional Planning, Iowa State University; fowusu@iastate.edu

[c] Dorothy Masinde, Teaching Professor, Department of Horticulture, Iowa State University; masinde@iastate.edu

[d] Ann Oberhauser, Professor, Department of Sociology, Iowa State University; annober@iastate.edu

[e] Carmen Bain, Associate Dean for Academic Innovation, College of Agriculture and Life Sciences, and Professor, Department of Sociology; Iowa State University; cbain@iastate.edu

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The first author's masters' thesis formed the basis of this article (Ikendi, 2019).

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food production and reducing malnutrition by 2025 (African Union, 2014). The Uganda Nutrition Action Plan I (UNAP) of 2011–2016 made gains in reducing child stunting from 33% to 29% and wasting from 5% to 4%. However, mothers and children's malnourishment persists (Office of the Prime Minister [OPM], 2020). The UNAP II 2020–2025 targets reducing malnutrition by leveraging collaborations to improve the functionality of nutrition intervention programs (OPM, 2020).

UNAP II aligns with our study of the Center for Sustainable Rural Livelihoods (CSRL) nutrition education centers in Uganda. The CSRL is an initiative of Iowa State University (ISU) established in 2003, based on a theory of change that involves identifying and building community capital toward food and nutrition security, improving household income, and accumulating assets (Ikendi & Retallick, 2023a; Masinde, Butler et al., 2015; Sseguya et al., 2009; 2015). The CSRL works with Makerere University (MAK) and several NGOs, including Volunteer Efforts for Development Concerns (2004–2014) and ISU Uganda Program (ISU-UP, 2014–present) (Butler & Acker, 2015; Ikendi & Retallick, 2023b). During 2004–2014, CSRL adopted a farmer-to-farmer extension approach, forming community food security groups to support farmer livelihoods (Butler & Mazur, 2015; Masinde, Butler et al., 2015; Sseguya et al., 2015). In 2014 the CSRL/ISU-UP adopted a "comprehensive capacity development" model (Ikendi, 2019, p. 50; see also CSRL, 2017). The model involves the lives of all people, from pregnancy to seniors, through interrelated livelihood programs. These programs include agronomy and postharvest management (Ikendi, Owusu, Masinde, Bain, & Oberhauser, 2023), livestock integration (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Masinde, McMillan et al., 2015), nutrition and infant feeding, and water supply hygiene and public health education (Ikendi, Owusu, & Masinde, 2023; Ikendi, Owusu, Masinde, Oberhauser, & Bain 2023b; Masinde, McMillan et al., 2015; Winham et al., 2016), school gardens and global service-learning (Ikendi, Retallick et al., 2023a; Nonnecke et al., 2015; 2016), and community income-generating innovations (Ikendi, 2019; Martin, 2018).

Abbreviations

Center for Sustainable Rural Livelihoods: CSRL
Food and Agriculture Organization of the United Nations (UN): FAO
Iowa State University: ISU
Iowa State University Uganda Program: ISU-UP
Makerere University Kampala Uganda: MAK
Mpirigiti Rural Training Center: MRTC
Nutrition education centers: NECs
Nongovernmental organizations: NGOs
Office of the Prime Minister: OPM
Uganda Nutrition Action Plan: UNAP
UN Sustainable Development Goals: SDGs

The CSRL Nutrition Education Programs

The CSRL nutrition programs have two components: school feeding and nutrition education centers (NECs). The school feeding initiative aims to improve nutrition among pupils by providing meals using contributions of maize and beans from parents and programs, and products from school gardens (Byaruhanga, 2016; Ikendi, Retallick et al., 2023a; Nonnecke et al., 2015; 2016). This commentary discusses the NECs, community-based rehabilitation homes that aim to help end hunger and malnutrition in Kamuli district, Uganda (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b, 2023c; Masinde, McMillan et al., 2015). Community members volunteer their homes for the CSRL/ISU-UP to set up the NECs based on demand and the availability of funds. Demand is assessed through rapid appraisals by program nutrition coordinators based on estimates of malnourished children, willingness of members to offer their homes as temporary operational sites, and the availability of hygiene facilities, including pit latrines, kitchens, and water sources (boreholes). Daily operations of the NECs are managed by community-based NEC trainers, mostly former enrollees who went through malnutrition rehabilitation. Trainers are mentored and monitored by ISU-UP nutritionists, and the nutrition associate directors of CSRL supervise all nutrition programs launched by ISU in Uganda. NECs have a sequential order of operation, from enrollment to graduation (discharge) and continued monitoring and evaluation of graduates to minimize relapses.

Enrollment

Three categories of at-risk-for-malnutrition clients are enrolled: mothers, infants, and children, who may come with guardians. Guardians are primary caretakers of at-risk-for-malnutrition infants, children, and/or mothers who are young or have disabilities. Mothers are either pregnant or breastfeeding. Infants (0–24 months) and children (24–59 months) of age are (a) breastfeeding and on therapeutic porridge (details below), (b) infants less than six months old on exclusive breastfeeding who enrolled with their mothers, (c) babies born at the NECs to at-risk-for-malnutrition pregnant mothers during their rehabilitation, and/or (d) malnourished children—the NEC only enroll children suffering from moderate acute malnutrition (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b) and the rest of the children come along with their mothers. Both mothers, infants, and children are referred to the NECs by either community leaders, healthcare nurses when mothers go for routine care and treatments, NEC trainers during community monitoring work, ISU-UP staff during fieldwork, NEC hosts, and/or fellow mothers. When mothers and/or their children come to the NECs, trainers record their biodata and anthropometric data, which is used as the baseline for monitoring improvements during rehabilitation. Data include age, sex, mid-upper arm circumference (MUAC), height or recumbent length (for infants), weight, vaccination, and mother's prenatal care.

Complementary Services

NEC services are available Monday through Friday. Most of the services are accessed by community members irrespective of their affiliation with the NECs. Among the services, therapeutic porridge (cooked) and/or flour is served only to enrolled clients. Mothers who live far away, are given packed flour to cook at home (details below). Up to 89.6% (n=283) of 316 CSRL/ISU-UP households in this study received some services, including therapeutic porridge, nutrition and health information, immunization during community outreach on clinic days or at the NECs, HIV/AIDS testing, and counseling and/or family planning conducted with assistance from government healthcare nurses (Ikendi, Owusu, & Masinde, 2023; Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b).

Therapeutic Porridge Flour Production, Cooking, and Eating

The flour used for the therapeutic porridge is made from crops grown by farmers and from local fish (silver fish), which are purchased by CSRL/ISU-UP. The flour ingredients include millet, amaranth grain, soybean, maize, and dried silver fish, which are ground together at a mill. Ground flour is kept in CSRL/ISU-UP storage and provided to NECs based on the number of clients they have enrolled. Cooking rotations are organized by NEC trainers; mothers help in cooking and serving the porridge. Sugar and milk are also added to the porridge. CSRL/ISU-UP nutritionists conduct training and demonstrations on cooking the porridge. After cooking, each mother and/or child is given three cups: one is eaten at the NEC, and two are packed for eating at home. A cup equals 350 ml (11.8 oz.) and yields 457 kilocalories (457 U.S. calories), and 17g of protein for every 100g of porridge.

Community Education

NEC clients and interested community members are routinely trained to build their capacity toward food and nutrition security. Education programs include agronomy and postharvest management training to equip households with agronomic practices that increase food production and income (Ikendi, Owusu, Masinde, Bain, & Oberhauser, 2023). Nutrition, infant feeding, and health training aim at behavioral change in feeding, maternal, and reproductive practices, including prenatal care, childbirth, breastfeeding, and sanitation, such as construction of sanitation facilities (Ikendi, Owusu, & Masinde, 2023; Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b; Masinde, McMillan et al., 2015; Winham et al., 2016). Livestock integration programs improve the production and consumption of animal-source proteins (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Masinde, McMillan et al., 2015). Community income-generating innovation strategies are provided to harness clients' handicraft skills and expand their income sources (Ikendi, 2019; Martin, 2018),

increasing their food purchasing power in current trend of soaring food prices (Headey & Ruel, 2023).

Training programs are planned by CSRL/ISU-UP extension personnel and community stakeholders doing related work, like the government departments of water, agriculture, health, and community development, and various nongovernmental organizations (NGOs) involved in related work, such as gender issues. Schedules are synchronized (Figure 1); for instance, during planting, training in land preparation and sowing practices are provided, and during harvesting periods, post-harvest technologies are emphasized. Program nutritionists, NEC trainers, and nurses continuously conduct nutrition, water, and health training. Global service-learners from ISU and MAK participate in reciprocal learning while working with the communities (Ikendi, Retallick et al., 2023b).

Monitoring of Clients

Monitoring keeps track of clients' nutritional health changes during rehabilitation. NEC trainers monitor participants at their NECs by taking anthropometric measurements and comparing them with the initial and continuous data collected by CSRL/ISU-UP nutritionists over time. These records are used in deciding when to graduate (discharge) clients. Trainers also do home visits once a month to check the state of clients' sanitation facilities, like latrines, bathrooms, plate stands, rubbish pits, tippy-taps (simple and easily made handwashing stations that do not require piped water), and kitchens. Program agronomists keep track of mothers' records of field gardens, keyholes, sacks, and kitchen gardens and check the seeds and seedlings they were given to ensure they were planted properly. In addition to millet, soybean, and amaranths, common vegetables and greens, like spring onions, spinach, collards, eggplants, and garden eggs, are also given to NEC clients (Ikendi, Owusu, Masinde, Bain, & Oberhauser, 2023). NECs also have demonstration and learning gardens for most crops and vegetables, and the program has a livestock demonstration at the Mpirigiti Rural Training Center for training clients on livestock management (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Ikendi & Retallick, 2023b, p. 645).

Figure 1. Training Schedule for February 2019 by Nutrition Education Centers and Affiliated Health Centers

Days	Mondays		Tuesdays		Wednesdays		Thursdays		Fridays
Health Centers	Bugeywa	Nabirama	Bugeywa	Namasagali	Butansi	Namasagali	Butansi	Namasagali	Namasagali
NECs	Nakyaka	Kasozi-Nakanyonyi	Kabalira-Bugeywa	Bususwa	Bubogo-Kiwungu	Kisaikye	Naluwoli	Kiconco	Kakindu
Dates of Training in Febraury 2019 and Training Themes on Food and Nutrition Strategies	4th Balanced Diet (Food Groups and their Uses)	4th Immunization and Family Planning	5th HIV Testing and Counseling	5th Personal Hygiene: Nails, Hairs, Bathing	5th Immunization and Family Planning	6th Immunization and Family Planning	7th Indigenous Chicken Management	7th Personal Hygiene: Nails, Hair, Bathing	8th Immunization and Family Planning
	11th Agronomic Practices of NEC Produce	11th Effects of Gender-based Violence on Children	12th Agronomic Practices of NEC Produce	12th Immunization and Family Planning	13th Balanced Diet (Food Groups and their Uses)	13th Agronomic Practices of NEC Produce	14th Immunization and Family Planning	14th Immunization and Family Planning	15th Indigenous Chicken Management
	18th Immunization and Family Planning	18th Agronomic Practices of NEC Produce	19th Immunization and Family Planning	19th Agronomic Practices of NEC Produce	20th Agronomic Practices of NEC Produce	20th HIV Testing and Counseling	21st Agronomic Practices of NEC Produce	21st Balanced Diet (Food Groups and their Uses)	22nd Agronomic Practices of NEC Produce
	25th HIV Testing and Counseling	25th Indigenous Chicken Management	26th Balanced Diet (Food Groups and their Uses)	26th HIV Testing and Counseling	27th HIV Testing and Counseling	27th Balanced Diet (Food Groups and their Uses)	28th HIV Testing and Counseling	28th Agronomic Practices of NEC Produce	1st March End of Month Meeting

Source: Ikendi (2019, p. 56).

Graduation after Rehabilitation

Based on biometrics records, an assessment is done for rehabilitated clients to qualify for graduation or discharge. For children, the criteria is based on having an MUAC of at least 13.7cm (5.4 inches), along with the health and nutrition outlook of the child. Overstaying at the NECs is not recommended because it can result in becoming overweight from feeding on therapeutic porridge and also increases program expenses. Mothers are prepared to graduate by receiving a package of planting seeds, such as soybean, grain amaranths, and millet, a season before their planned graduation so that they can continue making porridge (Ikendi, Owusu, Masinde, Bain, & Oberhauser, 2023). Mothers undergo a discharge training process, and then graduation is conducted. Graduates are issued recovery certificates to be eligible to enroll in other programs, including Food and Nutrition Security Support Groups, to ensure their sustainability and increase livelihood strategies. Rehabilitation and empowerment of women through the NECs is one way of influencing future food production, reducing the burden of food and nutrition insecurity in Uganda (Barak et al., 2023).

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COMMENTARY

Engaging rural youth in strengthening the local food movement in India

Ishwari Singh Bisht*
Haldwani, India

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In India, traditional agriculture has historically been a subsistence-oriented, labor-intensive, closed-loop, and varied production system. Farming has long formed the foundation of the rural economy and served as a means of subsistence for local communities. Until a few decades ago, rural youth were actively choosing farming as a career, serving as the main workforce in a variety of agricultural enterprises. However, most of today's youth do not want to work in low-value agriculture. Instead, they migrate to urban areas, within or outside of their home states where there are not many opportunities for quality work, social services, or protection. Responding to these constraints through more inclusive changes in rural areas and through the alignment of rural-urban linkages is a significant challenge. It is crucial to look at opportunities and address obstacles in order to ensure that agriculture is economically viable and provides year-round employment for young people in rural India.

In our recent exploratory case study on hill farming (Rana & Bisht, 2023), we investigated ways in which young people from rural areas could be included in the changes being made to the food system. Youth across the globe are demanding three fundamental changes to improve access to nutritious foods and enhance food system resilience: (a) ensure that young people are part of the necessary overhaul and widespread transformation of food systems; (b) enhance food system resilience through food system transformation; and (c) enforce food system transformation through healthier and more sustainably produced and consumed foods (Glover &

* Ishwari Singh Bisht, independent researcher; Bithoria No.1, Amritashram (Lane #18); Haldwani (Uttarakhand)-263139, India; bisht.ishwari@gmail.com

In 2018, Dr. I. S. Bisht superannuated from active services as principal scientist and professor, ICAR–National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi, India. After retiring, Dr. Bisht worked as consultant from 2018 through 2023 in a UNEP-GEF Project titled "Mainstreaming agricultural biodiversity conservation and utilization in agricultural sector to ensure ecosystem services and reduce vulnerability in India," jointly operated by the Alliance of Bioversity International and CIAT and the Indian Council of Agricultural Research (ICAR). Dr. Bisht is presently working as a freelance researcher on traditional farming and food systems, and more particularly, on aspects of indigenous food sovereignty, eco-nutrition and community empowerment.

Sumberg, 2020). Building resilience to overcome vulnerabilities in a secure food system necessitates large-scale shifts to sustainable, nature-based production. Since the right to food is universal, addressing political and environmental challenges demands robust, multistakeholder efforts.

Furthermore, India achieved food independence through the conventional "productivity-driven" agriculture of the Green Revolution, but with only two staple crops—wheat and rice—at the cost of the environment and the socio-economic system. The multi-crop model that prevailed in other traditional agroecosystems was largely ignored in favor of the mono-crop model. Unreliable and rapidly declining energy and mineral resources have turned agriculture into a carbon-intensive industry, contributing to climate change and leading to more profound ecological and existential issues (Das, 2019; Kumar, 2019).

Agroecology is a dynamic concept that recently has gained traction in the fields of science, agriculture, and policy (Bisht et al., 2022). Agroecology is increasingly promoted as a way to transform food systems through the introduction of ecological principles into agriculture, the use of renewable resources, and the implementation of socially responsible food systems where consumers have control over what they consume, how it is produced, and where it is produced.

In this commentary, I focus on two key areas where the local food system can be strengthened through the involvement of rural youth, who can bring sustainability to farming and food systems:

1. Agroecology-based Community Kitchens

In November 2021, the government of India started drafting a national policy to set up community kitchens throughout the country. This step was taken in response to the public interest litigation (PIL) filed in the Supreme Court by social activists wanting to combat malnutrition and hunger. Community kitchens provide food either for free or for a nominal charge. Several state governments and a few NGOs have already set up community kitchens to feed the poor. During the COVID-19 lockdown, community kitchens run by women self-help groups (SHG) provided food to the most poor and vulnerable. Even though several states have community kitchens, there is no expansive national policy, and as a result, only some areas have access to free or subsidized food.

The majority of the state-run community kitchens in India serve food for free or at subsidized rates. The food grains for the community kitchen are sourced through public distribution systems (PDS). The government also currently provides free rations to 813.5 million poor people under the National Food Security Act (NFSA) of India. Tons of food grains rot every year at the Food Corporation of India (FCI). But by supplying the food grains to poor people or to community kitchens, the waste of food grains can be prevented. Conventional food, which is produced using agrochemicals and pesticides, is procured from farmers by government agencies, and is paid at a rate that is unfair to farmers and farm laborers who struggle to obtain dignified livelihoods. Charity food projects often rely on donations to provide food to those in need, without taking into account the social and economic disparities within food systems that affect farmers and consumers.

What is really needed is a transformative community kitchen based on agroecology that can play a key role in the radical transformation of the whole food system, including relationships both with producers and urban consumers. In several cities across the Global North for the past decade, grassroots efforts have addressed the many gaps in current food systems—especially the lack of equitable and regular access to nutritious, high-quality, high-nutrient, and culturally appropriate food for a growing number of underprivileged, vulnerable, and marginalized populations. Programs range from food banks and soup kitchens to social supermarkets and community kitchens. While the current inequitable and unsustainable food systems were exacerbated by COVID-19, there was also a surge in community-led food support projects, many of which focus on solidarity cooking. While it is commendable that surplus food or food waste is being used to feed those in need during emergency situations, normalizing the sale or distribution of surplus food as "cheap food" overlooks the fact that food surplus occurs because the powerful retail sector "purchases" agricultural produce at inflated farm prices at the expense of farm work-

ers' right to a dignified existence. Even though overproduction is a major contributor to environmental degradation (roughly 30–50% of the world's food is wasted), more farmers are opting out of farming each year due to their inability to make a livelihood from it.

For this reason, one of the key challenges for community kitchens is to get rid of food coming from the public distribution system (food waste), while at the same time providing access to an agroecological diet that is nutritious and produced and sold in a fair and ethical manner. Smallholder farmers in most of India's traditional agroecosystems are better equipped to grow agroecological food locally. There is therefore great potential for agroecology-based community kitchens to become sites of decolonization and restructuring of entire food systems. Neighborhood farmers can provide culturally appropriate, high-quality, and nutritious food through partnerships with community supported agriculture (CSA) models (producer-consumer alliances). By applying the CSA model (Bisht et al., 2020), community kitchens can enable wider access to healthy food, which would otherwise only be available to the middle and upper classes.

A transformative community kitchen based on the principles of agroecology can play a pivotal role in the radical restructuring of the entire food system, including the relationships between producers and urban consumers. By making food widely available, it would address unequal access to healthy food for all. Cooking and eating together can break the patriarchal and individualistic approach to food. By sourcing food from local agroecological farmers, culturally appropriate food is made available to a greater number of people. Local marketing and direct delivery of local farm produce to youth SHG-run community kitchens and school, university, and hospital cafeterias would help to revitalize traditional smallholder agriculture and create more employment opportunities for rural youth at the community level.

2. Culinary Agri-ecotourism

Ecotourism is well developed in India, and agri-ecotourism is a growing sector with huge potential to revive traditional agriculture and provide employment to rural youth. Rural culinary tourism, or agri-ecotourism, is a symbiotic relationship between tourism and agriculture, in which farmers and farms play a key role in development and contribute to a more prosperous rural economy. Agri-ecotourism utilizes rural culture as a tourism resource. It is taking on new dimensions as a potential source of income and employment. Agri-ecotourism is an important opportunity to develop niche markets for tourists and consumers, based on new food and nutrition experiences with traditional crops and new educational experiences through exposure to different agricultural production systems. The combination of tourism and agriculture in agri-ecotourism is an environmentally friendly and socially responsible form of tourism.

India's traditional agricultural landscapes have enough potential for tourism combined with agriculture. Agricultural ecotourism involves native peoples whose farming and herding are part of their customary knowledge and cultural identity and can be experienced firsthand. India is a country of rich cultural diversity, and its rural areas are a treasure trove of indigenous food traditions that have been passed down from generation to generation. These culinary practices not only reflect the diversity of the native communities of India, but also demonstrate their deep connection with nature and a sustainable lifestyle. Experiencing authentic local cuisine is considered an important part of what makes an eco-holiday enjoyable and memorable; therefore, traditional food plays an important role in agricultural ecotourism. The participation of young people in agri-ecotourism, particularly in homesteads as a livelihood strategy, is seen as important for their employment prospects. Community-based ecotourism or agricultural ecotourism that provides a livelihood strategy—which can be managed and sustained at the local level—has a greater chance of truly benefiting the local population, in particular the rural youth.

In addition to foreign tourists, many domestic tourists currently prefer to travel within their own country, rather than abroad due to various uncertainties. More and more tourists prefer lesser-known nature-friendly areas.

Homestays in farms and nearby villages are being developed in remote rural areas in response

to large-scale migration of rural youth, the weakening of the local economy, and the growth of tourism. Culinary homestay tourism aims to revive traditional subsistence farming and preserve native food culture and cuisine.

Community-based tourism focuses on an intense host-guest interaction experience that often exposes guests to various tangible and intangible aspects of the host's food culture. Research on the relationship between food and tourism focuses mainly on the perspective of the tourists, so the host's point of view must be investigated, especially in regard to the impact of tourism on the local food culture. The country's tourism industry recognizes its potential beyond its rich culture and heritage, and is now capitalizing on such culinary travel opportunities. The focus is on traditional food systems, the inherent wisdom of culinary practices, and connecting with what we eat.

Moreover, the slow food movement is now spreading to the Indian market and as it accelerates, the onus is on the entire hospitality industry to promote local, organic, and sustainable food, with youth leading the way. It is necessary to preserve the centuries-old experiences and traditions of previous generations; otherwise we will lose the choices, tastes, landscape diversity, and wildlife associated with traditional farming. Organizations and individuals work with rural youth to revitalize local food systems and help small producers achieve tangible results to support and sustain local jobs in these economies.

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COMMENTARY

Assessing food systems funders' use of data and evidence to make funding decisions

Lesli Hoey,[a] * Lilly Fink Shapiro,[b] and Catherine Diggs [c]
University of Michigan

Duncan Hilchey [d]
Journal of Agriculture, Food Systems, and Community Development

Kim Hines [e]
North American Food Systems Network

Fally Masambuka-Kanchewa [f]
Iowa State University

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Abstract

Although academic journals are often considered to be reliable sources of evidence for informing practice, the extent to which funders turn to them to shape their decisions is unclear. We carried out a survey to examine the types of evidence and knowledge that food systems funders use—and need—to make informed decisions, and to understand how research, particularly from journal publications, is or is not informing food systems investments. The majority of the 19 respondents worked for private foundations or community-based nonprofits that offer grants, loans, or other program-related investments to U.S.-based initia-

[a] * *Corresponding author:* Lesli Hoey, PhD, Associate Professor of Urban and Regional Planning, University of Michigan; Art and Architecture Building; 2000 Bonisteel Blvd.; Ann Arbor, MI 48109 USA; lhoey@umich.edu

[b] Lilly Fink Shapiro, MPH, Lead Evaluation Associate, University of Michigan; finkshap@umich.edu

[c] Catherine Diggs, BS, MURP and MS in Environmental Justice Student, University of Michigan; catdiggs@umich.edu

[d] Duncan Hilchey, MRP, Editor-in-Chief, *Journal of Agriculture, Food Systems, and Community Development*; and Co-director, Thomas A. Lyson Center for Civic Agriculture and Food Systems; Ithaca, NY, USA; duncan@lysoncenter.org

[e] Kim Hines, MA, Leadership Co-Chair, North American Food Systems Network; kim@foodsystemsnetwork.org

[f] Fally Masambuka-Kanchewa, PhD, Assistant Professor of Agricultural Communication, Iowa State University, fallymk@iastate.edu

Author Disclosures

Co-author Duncan Hilchey is the editor-in-chief of JAFSCD. He participated in the design, execution, and analysis of this survey. The Sustainable Agriculture and Food System Funders provided funding for JAFSCD's participation in the annual SAFSF Forum. SAFSF did not particpate in the study design, execution, or analysis beyond providing Forum attendees' contact information. The outcomes of this study do not materially benefit any of the authors.

Author Note

Portions of these findings were presented during the *Journal of Agriculture, Food Systems, and Community Development* (JAFCSD) Shareholder Consortium annual meeting, held via Zoom on March 8, 2023.

tives focused on local food, sustainable agriculture, and food access. Many respondents indicated that they draw primarily on local stakeholders and grantees to make funding decisions and do not prioritize scientific knowledge or externally derived evidence. For most, peer-reviewed academic journals, including the *Journal of Agriculture, Food Systems, and Community Development* (JAFSCD), are one of the last places they currently turn to for information that could shape their funding priorities. In other sections of the survey, however, respondents indicated that they value utilizing a blend of scientific research and local knowledge. Only four respondents require grantees or borrowers to carry out formal evaluations, and over a third of respondents are not satisfied with how their organization uses data and evidence to make decisions. They suggested a variety of ways that research could be made more accessible and relevant to them as funders and investors in the food systems arena. We suggest various ways that more comprehensive research could be conducted to study what drives the decision-making processes of the diverse U.S. food systems funding community.

Keywords
food systems funders, academic research, local knowledge, evidence-based philanthropy, private foundations, scientific data, community-based nonprofits

Introduction

The *Journal of Agriculture, Food Security, and Community Development* (JAFSCD) set out to be different from other journals when it was launched in 2010. In addition to switching in 2018 from a traditional subscription model to the world's first community-supported, open-access journal that focuses on applied research on food systems, it also solicited volunteer stakeholders to draft and share the JAFSCD Equity Agenda.[1] An underlying assumption behind the JAFSCD Equity Agenda is that the research JAFSCD publishes will be read by and inform the work of key institutions that shape food systems.

We set out to determine if this assumption is true by focusing on one particularly influential set of institutions: food systems funders. As JAFSCD Shareholder Consortium members, staff, and authors, we were especially interested in understanding the extent to which JAFSCD and other food systems journals are a source of information that funders rely upon to shape their decisions. We were also interested more broadly in the types of evidence and knowledge that food systems funders use and need to make informed decisions, and to understand how research is or is not informing food systems investments.

Our questions were in part motivated by a session JAFCSD was invited to lead at the annual Sustainable Agriculture and Food System Funders (SAFSF) Forum in Kansas City, Missouri, in 2022, called "The Facts Do Matter: Using Evidence-Based Information in Funding Decisions." SAFSF is made up of approximately 100 members who include a mix of "individual investors, regranting organizations, community foundations, [and] corporate and private foundations" (SAFSF, n.d.-a, para. 4), and the SAFSF Forum is "the only national gathering for and by funders supporting just and sustainable food systems change" (SAFSF, n.d.-b, para. 1).

Ensuring that food systems financing is catalyzing the alternative food movement[2] is more critical now than ever, given the increased mobilization around the climate crisis and the growing collective reckoning surrounding structural racism and associated food systems failures that the COVID-19 pandemic made even more apparent (Beer et al., 2021). We argue that systematic research on these types of food systems trends, as well as the emerging and long-standing responses

[1] JAFSCD's Equity Agenda states that the journal aims to "1. Amplify voices in the food system that are currently underrepresented in journal content; 2. Develop the capacity of university-based academics and others (e.g. research scientists and policymakers) to work as better allies and accomplices in social equity and food justice action, education, and research in and across the food system; and 3. To transform relevant JAFSCD and other institutional (e.g. USDA) practices and systems to be more equitable and just" (JAFSCD, 2019, Equity Agenda, para. 2).

[2] Galt (2017) defines the alternative food movement as "recent social movements made up of diverse activists, organizations, institutions, and enterprises aiming to create food systems that differ from industrial agriculture and the industrial food system" (p. 1).

being pursued by frontline organizations, should play a critical role in showcasing what, where, and how funders can most effectively support efforts to build more just, healing, and ecologically sustainable food systems. Examining where food systems funders are learning about what to fund, therefore, is in part a question about whether academic research is relevant to and is reaching funders.

Methods

We developed a survey largely designed around research related to "evidence-based philanthropy" (Easterling & Main, 2016; Greenhalgh & Montgomery, 2020). We received feedback on an early survey draft from a senior food systems foundation grant officer and SAFSF member. The 20-question survey asked about the respondent's role in their organization, the type of funding offered, where and on what topics their organization focuses, the type of information and sources they rely upon to make decisions about what to fund, and how they evaluate impact (see Appendix A for the full survey).

Aside from several open-ended questions, most of the questions were closed-ended multiple choice or Likert scale questions, usually offering an "other" option where respondents could add their own answer or explain. The survey was first distributed during and after the annual SAFSF Forum held in Kansas City in late June 2022 via a QR code on table toppers. We also followed up with emails to SAFSF members and Forum attendees. In early September 2022, we promoted the survey again through an email list of 35 additional food systems funders developed with JAFSCD staff. In total, we received 19 completed surveys.

Findings[3]

Over half (53%; 10) of the respondents worked for private foundations and 21% (4) for community-based nonprofits. Two of those four respondents also worked for a regranting organization and a Community Development Finance Institution (CDFI). An additional 11% (2) of respondents worked for corporate funds. The three remaining respondents worked for a community foundation, a philanthropic advisory group, and an investment advisory firm. The majority (89%; 17) of the survey participants worked for organizations that provide grants; 26% (5) worked for organizations that also (or only) offer loans or program-related investments. Individual organizations indicated that their organizations also offer "revenue-based finance," "equity and managing grants for the state," and "investments in debt or equity."

Respondents indicated that their organizations fund a broad array of work. Most common was the promotion of local food (26%; 5), sustainable (e.g., diversified, small-scale, organic, regenerative) agriculture (21%; 4), and increased access to healthy food (21%; 4) (see Appendix B, Question 5 for more detail). All organizations fund work located in the U.S., including 26% (5) in a single state; 26% (5) in 2 to 9 states; and 16% (3) in more than 10 states. One respondent noted that their organization concentrates most of its work in a single state but also "operates nationally." A few organizations (21%; 4) work in the U.S. and internationally, and one organization works in two U.S. states and one city in Canada. The multiple roles respondents played in their organizations included project selection (74%; 14), grantee support (68%; 13), administrative roles (53%; 10), program evaluation (53%; 10), outreach and marketing (37%; 7), and fundraising (21%; 4).

Engagement with Food Systems Research Publications

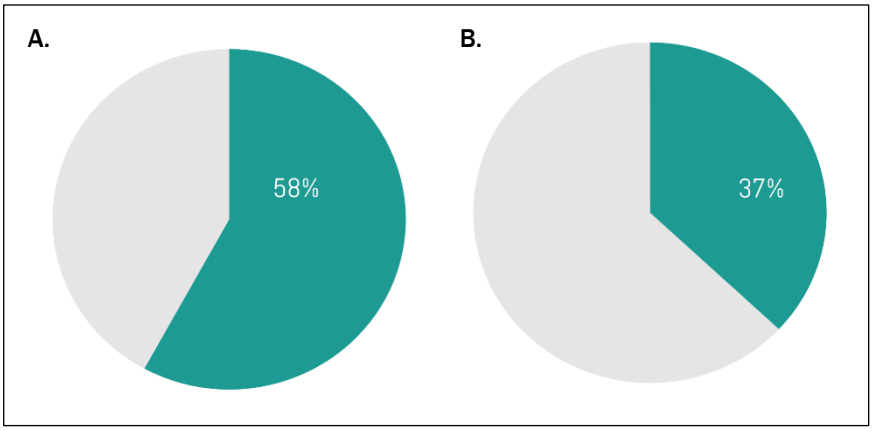
Nearly two thirds (63%; 12) of respondents indicated that they read research publications; the most common reason (58%; 11) is "to stay abreast of food systems trends that could shift their organizations' funding priorities" (see Figure 1A). Over a third (37%; 7) of respondents, however, indicated that they do not read research publications (see Figure 1B).

Another reason that some respondents do read about research is "to provide existing grantees with the best available information to strengthen their capacity (e.g., to develop more evidence-based strategies, to improve how they evaluate their impact,

[3] See Appendix B for additional figures and write-in answers for open-ended questions.

Figure 1.

A. Over half (58%) of respondents read research publications "to stay abreast of food systems trends that could shift their organization's funding priorities."
B. Over a third (37%) of respondents do not read research publications.



etc.)" (16%; 3), or "to identify organizations or initiatives they might consider funding" (16%; 3). Two people read research publications "to learn about locations in the country where they might want to target their work," or "to shape how they evaluate new proposals," and one respondent added that they do so "to identify gaps in research that need to be filled (which we can fund), to better understand what is working and what is not."

Only four respondents (21%) indicated that they read JAFSCD. Asked to name other food systems-focused research publications they draw on, two respondents listed *Civil Eats* and two said they read individual articles that are sent to them. Individuals also read articles or reports from Food Print, FERNS, Ag Insider, Grantmakers in Health, SAFSF, USDA, and "too many to list."

Information that Influences Decisions

Only a quarter (25%; 5) of respondents were satisfied with the way their organization uses data and evidence[4] to make decisions. Conversely, over a third (35%; 7) did not believe that their organizations use data and evidence to make decisions as effectively as they would like, while 40% (8) were unsure.

Many respondents indicated that they prefer a blend of local knowledge and scientifically collected data or evaluation to decide what to fund. For instance, asked on a scale from "1 = strongly disagree" to "5 = strongly agree," participants agreed most strongly with the statement, "Local knowledge coupled with scientifically gathered information can be a powerful combination as long as they are from trusted sources" (average 4.5). Most also agreed or strongly agreed with the statement, "Our organization believes that citing quantitative facts can complement qualitative information such as testimonies or storytelling" (average 4.3).

On the other hand, other answers suggested that local knowledge is often relied upon more than scientific research. Many, for example, agreed with the statement, "Our organization relies heavily on a locally driven process for identifying problems and deciding what to fund" (average 4). Some also agreed but most were neutral about the statement, "Our organization relies heavily on evidence-based information and evaluation for identifying problems and deciding what to fund" (average 3.8). Relatedly, on a scale from "1 = never a concern" to "4 = always a concern," the choice that drew the most "always a concern" answers was "Community-based organizations may resent the funder for not trusting the community and for honoring research more than local wisdom" (average 2.6). Five respondents were also concerned that "Because the program was developed elsewhere, local actors may not feel committed to implementing and sustaining it," although 58% (11) were not or only sometimes concerned about this issue (average 2.4) (see Appendix B, Q.11 for more detail).

Similarly, nearly all respondents look to grantees or practitioners to gather ideas or evidence to

[4] We did not define terms like "local knowledge," "evidence" or "evidence-based," letting respondents interpret the terms in their own way, although we usually said, "data and evidence" or "facts or evidence," in combination.

determine if a particular topic is worth funding or if a strategy they want to fund is likely to be successful, including:

- Evidence provided by potential grantees in project proposals (95%; 18);
- Ideas we gather from people in the field, including emergent ideas (95%; 18);
- Feedback and ideas we gather from our stakeholders and/or current grantees (84%; 16); and
- Webinars presented by various food systems organizations (e.g., EFOD Partnership, Intertribal Agriculture Council, First Nations Development Inc, Indigenous Food & Agriculture Initiative, Funder Affinity Groups, Michigan State University's Center for Regional Food Systems, Wallace Center's Food Systems Leadership Network, the North American Food Systems Network) (79%; 15).

Fewer, but still over half, of the respondents also noted that they draw on:

- Secondary data sources (e.g., U.S. Census, USDA research, IFPRI research) (58%; 11);
- News outlets (e.g., *New York Times*, Al Jazeera, MSNBC, etc.) (58%; 11);
- Their own staff (53%; 10); and
- Newsletters and blogs of food systems organizations (e.g., Food Tank, Native American Food Sovereignty Alliance, FoodFirst!) (53%; 10).

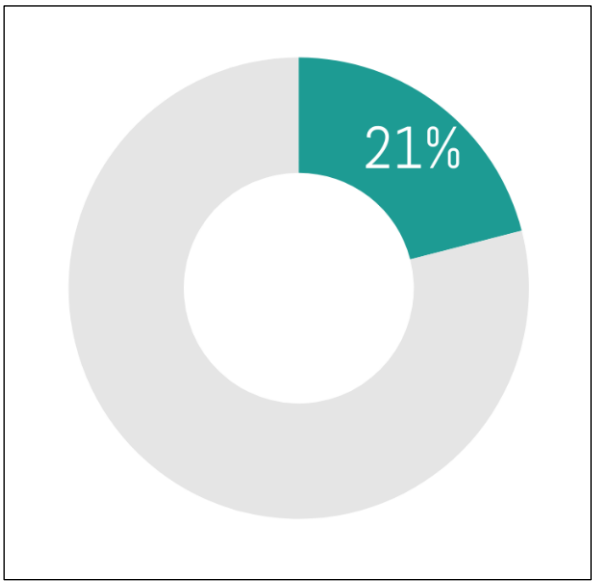
Eight respondents (42%) also use "Internal research initiatives: national scans or other studies that our organization leads or commissions." The least used sources of information included "peer-reviewed academic journals" (32%; 6), "boards of directors" (21%; 4), and "listservs where researchers and practitioners debate or share the latest research (e.g., COMFOOD)" (21%; 4). One respondent in the open-ended section also wrote that "there is both an art and a science to this: by staying in contact with the field, one has the possibility to see emergent trends, and/or spaces where a funder could partner as a contributor."

Grantee[5] Evaluation and Data-Sharing Requirements

More than three-quarters (79%; 15) of respondents indicated that their organizations "require progress updates or other reporting requirements, but no formal evaluation requirement" (see Figure 2). The four (21%) respondents from organizations that require formal evaluations noted that they prefer "qualitative data (e.g., case studies, interviews, focus groups, storytelling, etc.)" to measure community impacts, as opposed to quantitative data. One of these organizations requires the use of SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) indicators. Two "do not require their grantees to use indicators of any kind (i.e., they can develop their own if they want to use indicators)" and one "requires their grantees to use other types of evaluation metrics." One respondent added in the open-ended section that they have grantees report

Figure 2. Only 21% of Respondents' Organizations Require Evaluation

All others indicated that they require progress updates or have other reporting requirements, but do not require formal evaluation.



[5] We use the term "grantee," but respondents indicated that some of their organizations also offer loans.

"the outcomes they hope to achieve and to evaluate their progress reaching those outcomes post-grant period."

Most respondents (79%; 15) encourage grantees to share their findings in "a project report, policy brief, or something similar." Many (42%; 8) also encourage grantees to share findings through "presentations on webinars, conferences, or summits," or via "discussions or other ways of sharing with peer networks, learning communities or communities of practice." Over a third (37%; 7) post their grantees' findings on their organization's website, via their social media, and/or by asking their grantees to do so (32%; 6); 21% (4) encourage the sharing of information via "press releases or formal media outlets"; and two encourage the use of peer-reviewed journals or other published research outlets. Several indicated that reporting is context-specific or is left to the grantees' preferences.

Data Needs

To support their decision-making, most referred to the need for easy-to-understand and more systems-based and policy-oriented findings. More than two-thirds of respondents, for instance, stated a desire for "research on systemic change strategies, including policy efforts" (68%; 13), "more publicly facing (i.e., easy to understand) summaries of academic research that explain the policy and practice implications" (63%; 12), and "case examples of what works and other research on good or promising practices" (53%; 10). Many were also interested in "research about emerging food systems innovations" (47%; 9), "up-to-date trends on new or emerging food systems issues" (42%; 8), and "more interdisciplinary research that demonstrates the interconnection between topics (e.g., health, environment, and economics)" (42%; 8) (see Appendix B; Q.18 for more detail).

Similarly, of the seven responses to an open-ended question about the "biggest research gaps related to their data needs," two referred to the need for "measurable" and "concise" data, and two wanted clearer explanations of the policy implications of research or "tools to pull out what is needed in a concise way," citing their lack of capacity: "We have a small staff and a lot of work so this often isn't done to the level we would like." Individual respondents listed specific data they need, such as "research related to what we know from farms anecdotally," "race and ethnicity data," and "system change indicators and metrics that are relevant to community change."

Finally, eight people responded to another open-ended question about how researchers or evaluators could better support more informed decisions about new initiatives to fund and/or to support current grantees. Three called for improved communication on the part of researchers and evaluators, or, as one person put it, "de-jargoning impact analysis frameworks and tools." Respondents noted that better data were needed on topics that are underfunded, such as the relationship between "economic and environmental security and racial equity," "farm animal welfare and healthy food," and "how to build a robust climate-forward and resilient food system." One respondent also suggested that researchers could support better decision-making structures, such as "volunteer panels" who can offer input in their decisions. Finally, one person called on researchers, "in general, to help funders move from counting widgets to looking at system change—and the need for long term sustained support to facilitate change."

Discussion

These findings suggest that different types of funders, or perhaps funding organizations themselves, may have conflicting practices around their use of data and evidence to make funding decisions. On the one hand, many indicated that they draw primarily on local stakeholders and grantees to make funding decisions, do not prioritize scientific knowledge or externally derived evidence, and do not impose externally developed programs. For most, peer-reviewed academic journals, including JAFSCD, are one of the last places they currently turn to for information that could shape their funding priorities. They noted that they prioritize local and grantee knowledge over scientific research, in part, because they worry that their grantees "may resent the funder for not trusting the community and for honoring research more than local wisdom."

In other sections of the survey, however, respondents indicated that they value utilizing a blend of scientific research and local knowledge, as well as quantitative and qualitative data, to guide their decisions. Nevertheless, only 21% (4) of respondents indicated that their organizations require grantees or borrowers to carry out formal evaluations. This, and the fact that over a third of respondents are not satisfied (and 40% unsure) about how their organization uses data and evidence to make decisions, also suggest that they might find more actionable evaluations useful, as well as more accessible and relevant research. As some indicated, what would be especially welcome is easy-to-understand summaries of academic research demonstrating clear policy implications or outlining systemic change strategies.

The ambivalence or contradictory responses found in our survey may be due in part to the academic publication process, which can often be too slow to inform urgent decision-making (Christie et al., 2021). This means that community-based groups may offer insights about innovations and emerging trends that funders are learning from and funding, long before academic research on the same topics may come to exist (or be published). Or perhaps the issue is not having sufficient "boundary spanners" who create a bridge between academic institutions and funding agencies (Tseng et al., 2022). These boundary spanners play a key role in implementing "relational" rather than "linear" approaches to disseminating research findings to ensure that research meets "the needs and contexts of its would-be users," to more directly affect policy and funding decisions as well as practice (Tseng et al., 2022, p. 2). Relational approaches to research dissemination do not assume that findings are inherently useful and simply need to be communicated. Instead, they assume that research, from conception, must actively respond to the needs of decision-makers (Tseng et al., 2022).

Limitations and Suggestions for Future Research

Our survey results raise more questions than answers and should be seen as a starting point for further conversation and research about what drives the decision-making processes of food systems funders, rather than a conclusive or representative perspective of the large and diverse U.S. food systems funding community. Several changes to the approach we took with this exploratory study would offer a more complete picture of the food systems funding landscape.

First, future iterations of a food systems funders survey should aim to secure more responses to increase the statistical significance of the survey findings. Crosstab data, discriminant and cluster analysis, and other forms of comparison would enable the creation of a typology of funders based on their use of evidence-based information. Private foundations, for instance, seemed over-represented in our sample, compared to nonprofits that engage in regranting or CDFIs. The response rate might increase if future invitations are personalized or if surveys are conducted in person at already occurring food systems conferences or summits, like a future SAFSF Forum.

Second, future surveys should collect the names of the organizations that respondents work for, even if they are kept confidential when reporting findings. We designed this survey to be anonymous to elicit honest responses—by asking for neither the name of the respondent nor their organization—but this prevented us from determining with certainty whether more than one person per organization took the survey. We have reason to believe, however, that at least 16 of the 19 respondents were from different organizations, since the information provided (e.g., type of organization, type of funding offered, geographic scope, and type of initiatives funded) was very similar for only three pairs of organizations. Still, knowing for certain whether some respondents were from the same organization would have prompted us to analyze those responses differently, such as determining if there are divergent views within a single organization, depending on staff roles.

Third, a more robust understanding of food systems funding would also emerge if a survey such as ours were accompanied by in-depth interviews. When we presented these initial findings at a JAFSCD Shareholder Consortium meeting, for instance, Consortium members suggested that we could ask about varying interpretations of "evi-

dence" that may not have been captured by our closed-ended questions. Additionally, they suggested that more open-ended questions would be useful on a range of topics, including the processes organizations use to develop calls for proposals, how they may be influenced by other funders, how they define "success," and how committed (and in what manner) the food systems funding community is to addressing issues related to decolonization, white supremacy, structural racism, and the climate crisis.

Finally, another set of interviews and/or a different survey that would be useful to carry out would focus on the diverse mix of food systems organizations that rely on food systems funding, particularly those who center sustainable and just food systems transitions. Comparing their views with those of funders would reveal where there might be divergent views about the forms and sources of evidence and knowledge that should be valued in funding decisions and how food systems funding processes themselves could be democratized. As was expressed in "an open letter from BIPOC leaders in food and agriculture to food systems funders," supporting a just food systems transition also requires "more just ways of giving" (HEAL Food Alliance, 2020).

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Appendices

Appendix A. Survey Instrument as Created and Conducted Using Qualtrics

Sponsored by the *Journal of Agriculture, Food Systems, and Community Development* (JAFSCD), this survey is designed to identify the data needs and types of evidence that food systems funders and philanthropy professionals use to make informed decisions. The results will be published as an open access commentary in JAFSCD and/or submitted for a peer-reviewed article. Our goal is to inform food systems researchers about ways their work can be adjusted to improve the targeting of funding resources, reduce redundancy, and increase the overall impact of funder investments.

Your answers will be anonymous. Results will be aggregated, and no identifiable information will be used about you or your organization. Your answers will only be accessible to the JAFSCD staff and two researchers analyzing the survey (Dr. Fally Masambuka-Kanchewa, Iowa State University, and Dr. Lesli Hoey, University of Michigan). Your participation in this survey is voluntary—you may decline to participate and stop completing the survey at any point. Your completion of the survey indicates your consent to participate. If you have questions, please contact Fally (fallymk@iastate.edu) or Lesli (lhoey@umich.edu).

Thank you for completing this survey! It should only take you 10 minutes to complete.

1. What type of organization are you a part of? Select all that apply.
    - Community based non profit
    - Academic Institution
    - Private foundation
    - Donor Advised Fund
    - Community Foundation
    - Corporate fund
    - Charitable Trust
    - Regranting Organization
    - Community Development Finance Institution (CDFI, credit union)
    - Philanthropic Advisory Group
    - Investment Advisory Group
    - Other: _____

2. Does your organization offer funding of some kind (whether loans, grants, etc.)?
    - Yes
    - No
    - Other _____

3. What type of funding does your organization offer? Select all that apply.
    - Grants
    - Loans
    - Program related investments (PRIs)
    - Other _____

4. Where does your organization operate?
    - The U.S. and internationally
    - The U.S. only—in more than 10 states
    - The U.S. only—in 2 to 9 states
    - The U.S. only—a single state or location within a state
    - Other _____

5. What type of food and farming work does your organization tend to fund? [Open ended]

6. What types of activities are you personally engaged in within your funding organization? Select all that apply.
    - Administration
    - Project selection
    - Grantee support
    - Program evaluation
    - Outreach and marketing
    - Other _____

7. Do you read the Journal of Agriculture, Food Systems, and Community Development (JAFSCD)?
    - Yes
    - No
    - Unsure

8. What other food systems-focused research publication(s) do you read? [Open ended]

9. Why do you read research publications? Select all that apply.
    - To stay abreast of food systems trends that could shift our organization's funding priorities
    - To design more informed calls for proposals
    - To shape how we evaluate new proposals
    - To provide existing grantees with the best available information to strengthen their capacity (e.g., to develop more evidence-based strategies, to improve how they evaluate their impact, etc.)
    - To identify organizations or initiatives we might want to consider funding
    - To learn about locations in the country where we might want to target our work
    - I do not read research publications
    - Other _____

The next questions focus on the type of information that influences how you and your organization decide what to fund and how you keep track of the impact of your funding

10. To what extent do you agree with the following statements?

    1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

    - Our organization relies heavily on a locally driven process for identifying problems and deciding what to fund.
    - Our organization relies heavily on evidence based information and evaluation for identifying problems and deciding what to fund.
    - Our organization believes that citing quantitative facts can complement qualitative information such as testimonies or storytelling.
    - Local knowledge coupled with scientifically gathered information can be a powerful combination as long as it is from trusted sources.

11. Indicate the degree to which each of these concerns guides your organization's decision about engaging in evidence-based philanthropy.

    1 = never a concern, 2 = sometimes a concern, 3 = often a concern, 4 = always a concern

    - Local organizations may choose to adopt programs that have evidence but that are inappropriate to the local context (e.g., required resources not available).
    - Funders can incentivize the adoption of a certain program model or strategy, but can't control fidelity of implementation.
    - Because the program was developed elsewhere, local actors may not feel committed to implementing and sustaining it.
    - Community-based organizations may resent the funder for not trusting the community and for honoring research more than local wisdom.

12. Does your organization use data and evidence to make decisions as effectively as you would like?
    - No
    - Yes
    - Unsure
    - Does not apply

13. Where do you look for specific facts or evidence that a particular topic is worth funding or that a particular strategy will work? Select all that apply.
    - Internal research initiatives: national scans or other studies that our organization leads or commissions
    - The evidence provided by potential grantees in project proposals
    - Feedback and ideas we gather from our stakeholders and/or current grantees
    - Feedback and ideas we gather from people in the field, including emergent ideas
    - Our board of directors
    - Our staff
    - Secondary data sources (e.g., the U.S. Census, USDA research, IFPRI research)
    - Peer-reviewed academic journals (e.g., journals like JAFSCD, Agriculture and Human Values, Food Policy, etc.)
    - News outlets (e.g., New York Times, Al Jazeera, MSNBC, etc.)
    - Listservs where researchers and practitioners debate or share the latest research (e.g., COMFOOD)
    - Webinars presented by various food systems organizations (e.g., EFOD Partnership, Intertribal Agriculture Council, First Nations Development, Indigenous Food & Agriculture Initiative, Funder Affinity Groups, Michigan State University's Center for Regional Food Systems, Wallace Center's Food Systems Leadership Network, North American Food Systems Network)
    - Newsletters and blogs of food systems organizations (e.g., Food Tank, Native American Food Sovereignty Alliance, FoodFirst!)
    - Social media (e.g., Twitter, Facebook, Instagram, TikTok, YouTube)
    - Other sources: _____

14. Do you require your grantees or borrowers to do evaluations of the work you fund?
    - Yes, we require evaluations [skip pattern by going straight to question 15]
    - No, we have progress updates or other reporting requirements, but no formal evaluation requirement [skip pattern by going straight to question 17]
    - No, we have no reporting requirements once a grantee receives a grant or borrower receives a loan [skip pattern by going straight to question 17]

15. Do you require your grantees or borrowers to use SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) indicators for progress or accomplishment?
    - Yes
    - No, we do not require our grantees to use indicators of any kind (i.e., they can develop their own if they want to use indicators)
    - No, we require our grantees to use other types of evaluation metrics. Please explain: _____

16. What kind of data do you prefer that grantees or borrowers (and their evaluators) use to measure community impacts? Select all that apply.
    - Qualitative (e.g., case studies, interviews, focus groups, storytelling, etc.)
    - Quantitative data (e.g., surveys, participation rates, etc.)
    - Other _____

17. How do you encourage your grantees or borrowers to share their findings? Select all that apply.
    - A project report, policy brief, or something similar
    - Discussions or other ways of sharing with peer networks, learning communities or communities of practice
    - In peer-reviewed journals or published research outlets
    - On our organization's website
    - On the grantee's website
    - Through presentations on webinars, conferences, or summits
    - Via press releases or formal media outlets
    - Via social media
    - Other _____

18. Which of the following data needs does your organization have? Select all that apply.
    - Up-to-date trends on new or emerging food systems issues
    - Research about emerging food systems innovations
    - Research on systemic change strategies, including policy efforts
    - National data on key food systems topics related to our work
    - Case examples of what works and other research on good or promising practices
    - More publicly accessible datasets (e.g., we know data exists, but it's not being readily shared or it's hard to access or find)
    - More interdisciplinary research that demonstrates the interconnection between topics (e.g., health, environment, and economics)
    - Systematic reviews to synthesize large volumes of research
    - More publicly facing (i.e., easy to understand) summaries of academic research that explain the policy and practice implications
    - More relevant information on topics related to the specific work we do
    - More timely information that is aligned with decisions we need to make
    - Disaggregated data specific to a city, rural community or neighborhood where we work
    - Better measurement tools (e.g., methods, indicators or metrics) our grantees can use to collect more accurate data about their impact
    - Detailed, retrospective analysis of our failed projects
    - More staff in our organization with training in evaluation
    - More resources so that we can carry out or commission research specific to our needs
    - Access to professional advisors and networks of scholars to tap into for advice on the most up-to-date, relevant, and high-quality data we could use
    - Other _____

19. What do you see as the biggest research gaps related to your data needs? [Open ended]

20. How could researchers or evaluators better support your efforts to make more informed decisions about new initiatives to fund and/or to support your current grantees? [Open ended]

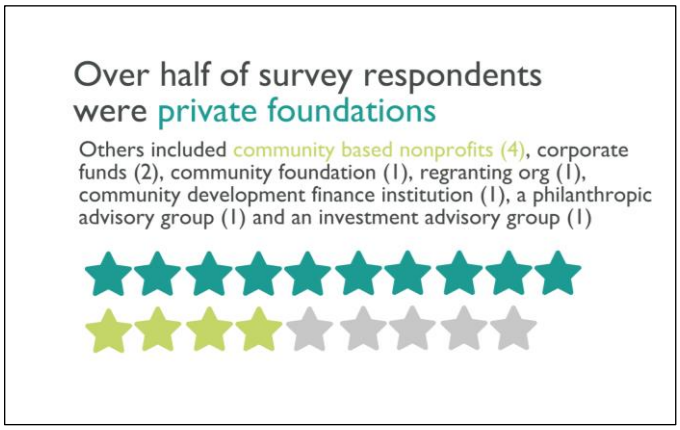
21. If you would like to receive JAFSCD's Article Heads-up press releases, please enter your email address using this [LINK] (this outside form will de-link your survey answers from your email address).

THANK YOU for completing this survey! We look forward to sharing the results with the SAFSF network. If you have questions or additional comments, please contact the survey designers, Dr. Fally Masambuka-Kanchewa, Iowa State University (fallymk@iastate.edu) or Dr. Lesli Hoey, University of Michigan (lhoey@umich.edu).

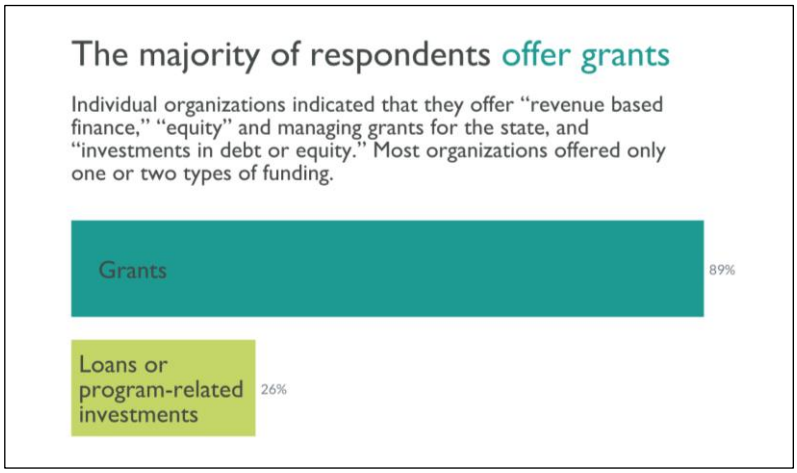
Appendix B. Additional Survey Figures and Responses to Open-Ended Questions 5, 11, and 18

The following figures offer a visual display of most survey responses described in the narrative of the report. Also provided in this appendix are the complete set of responses for questions 5, 11, and 18.

Q. 2. Does your organization offer funding of some kind (whether loans, grants, etc.)?



Q. 3. What type of funding does your organization offer? Select all that apply.

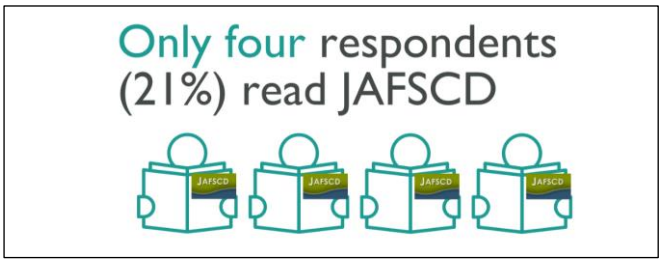


Q. 5. What type of food and farming work does your organization tend to fund? [Open ended]

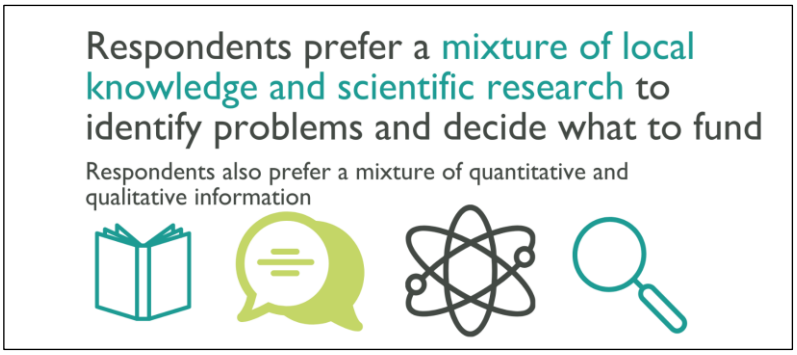
- The promotion of local food (26%; 5)
- Sustainable (i.e., diversified, small-scale, organic, regenerative) agriculture (21%; 4)
- Increased access to healthy food (21%; 4)
- "Equitable and sustainable/resilient food systems" (10%; 2)
- "Protection of agricultural land" (10%; 2)
- "Food as medicine" (10%, 2)
- Building capacity for small growers to engage with new markets (1)
- Assistance to new/small farmers (1)
- Farming on under-utilized land (1)
- Promoting values aligned procurement practices and policies (1)

- Support for entrepreneurs and food businesses by increasing access to capital (1)
- Humane animal agriculture (1)
- Strategies to transform food systems via local, state and tribal policy (1)
- Farm to Early Care and Education (ECE) and schools (1)
- Mobile markets (1)
- Urban agriculture and urban food systems (1)
- Food sovereignty (1)
- On-farm research (1)

Q. 7. Do you read the *Journal of Agriculture, Food Systems, and Community Development* (JAFSCD)?



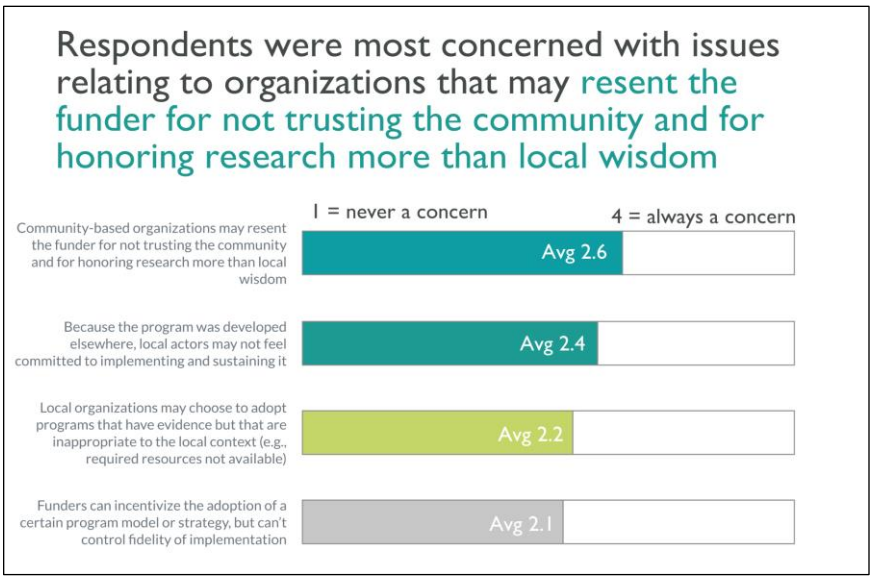
Q. 10. To what extent do you agree with the following statements?



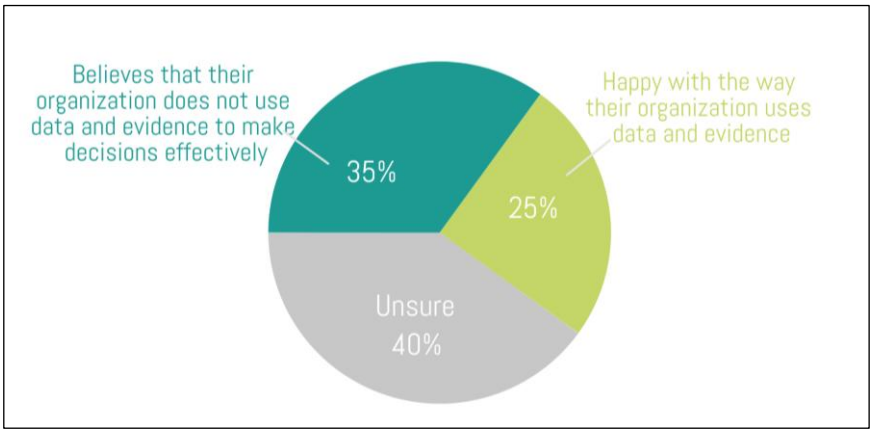
Q. 11. Indicate the degree to which each of these concerns guides your organization's decision about engaging in evidence-based philanthropy

1 = never a concern, 2 = sometimes a concern, 3 = often a concern, 4 = always a concern

- Community-based organizations may resent the funder for not trusting the community and for honoring research more than local wisdom. **(average 2.6)**
- Because the program was developed elsewhere, local actors may not feel committed to implementing and sustaining it. **(average 2.4)**
- Local organizations may choose to adopt programs that have evidence but that are inappropriate to the local context (e.g., required resources not available). **(average 2.2)**
- Funders can incentivize the adoption of a certain program model or strategy, but can't control fidelity of implementation. **(average 2.1)**

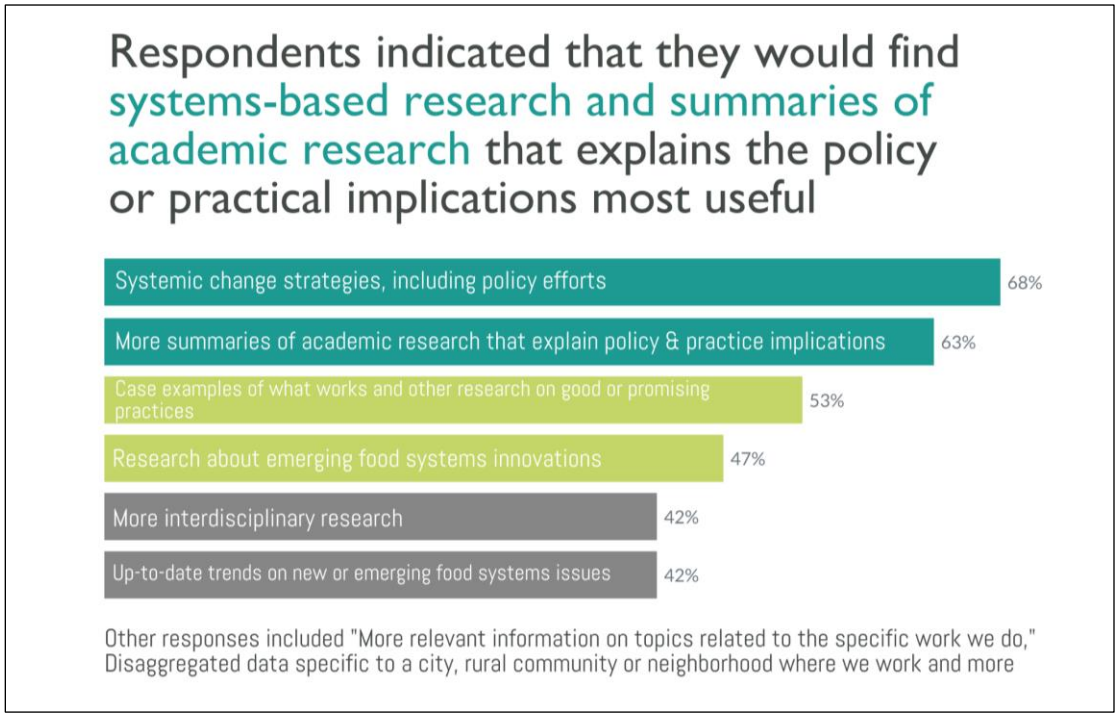


Q. 12. Does your organization use data and evidence to make decisions as effectively as you would like?



Q. 18. Which of the following data needs does your organization have? Select all that apply.

- Research on systemic change strategies, including policy efforts **(68%; 13)**
- More publicly facing (i.e., easy to understand) summaries of academic research that explain the policy and practice implications **(63%; 12)**
- Case examples of what works and other research on good or promising practices **(53%; 10)**
- Research about emerging food systems innovations **(47%; 9)**
- Up-to-date trends on new or emerging food systems issues **(42%; 8)**
- More interdisciplinary research that demonstrates the interconnection between topics (e.g., health, environment, and economics) **(42%; 8)**
- National data on key food systems topics related to our work **(37%; 7)**
- More relevant information on topics related to the specific work we do **(32%; 6)**
- Disaggregated data specific to a city, rural community or neighborhood where we work **(26%; 5)**
- More publicly accessible datasets (e.g., we know data exists, but it's not being readily shared or it's hard to access or find) **(21%; 4)**
- Better measurement tools our grantees can use to collect more accurate data about their impact **(21%; 4)**
- More resources so that we can carry out or commission research specific to our needs **(21%; 4)**
- Systematic reviews to synthesize large volumes of research **(16%; 3)**
- More staff in our organization with training in evaluation **(16%; 3)**
- Access to professional advisors and networks of scholars to tap into for advice on the most up-to-date, relevant, and high-quality data we could use **(11%, 2)**
- More timely information that is aligned with decisions we need to make (**11%; 2)**
- Detailed, retrospective analysis of our failed projects **(11%; 2)**
- Other _____ **(0)**



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COMMENTARY

Toward a more profitable value chain for New York state onions

Philippe Jeanneaux*
VetAgro Sup

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Abstract

For many years, New York onion growers enjoyed a leadership position in the U.S. onion supply due to a combination of advantages, including unique soil and climate conditions and proximity to large, diverse markets. However, trends suggest that these advantages are disappearing as global competitors offer comparable, but lower-cost, undifferentiated onions. As a result, the current production and marketing approaches of New York onion growers are not particularly effective. New York onion growers are presently competing in a race with each other and growers in other regions to produce high volumes of cheap commodity onions. The question thus becomes: Can onion producers continue this race, in which they seem unable to win because the competition is so fierce? Onion growers in New York state wish to understand onion-marketing dynamics in the U.S. and especially in New York state. By learning more about the market for onions, they may discover a new competitive advantage based on the strategy of differentiation, which could increase their value among all stakeholders of the value chain.

In this commentary, I present a summary of a report I have written entitled "Analysis of the U.S. Onion Industry with a Focus on New York State Issues," and I make the case that New York state's onion growers have an opportunity to reverse their fortunes.

Keywords

onion industry, market strategy, price analysis, New York state, muckland production, *terroir*

The *Terroir* of New York "Black Dirt" Onions

New York is endowed with a special organic soil naturally high in sulfur, and, along with reasonably good weather and knowledgeable growers, the yellow onion grows very well in the state. In France, we refer to this as *terroir* (pronounced "tahr-wah"), a concept that encompasses all of the microclimate and soil conditions along with the history, codes of practice, and traditions that link a food to its place of production (see Figure 1). For Americans, Champagne or Roquefort cheese are well-known

* * Philippe Jeanneaux, Professor of Rural Economics, VetAgro Sup–Clermont Auvergne University, Lempdes, France; Visiting Fulbright scholar, 2020–21, and Visiting Fellow, Department of Global Development, Cornell University; philippe.jeanneaux@vetagro-sup.fr

examples of products with *terroir*. But *terroir* exists all over the world. Some places with unique weather patterns, soils, and historical traditions have advantages in efficiently producing specialty crops and value-added foods over other areas. In France we have the Roscoff pink onion of Brittany, which, because of its fresh eating properties and beautiful color, has a protected designation of origin (PDO) label given to the growers by the European Union. The Roscoff onion has been highly prized by cooks even in the United Kingdom and beyond for over a century. The U.S. has many examples of specialty product areas that are branded, including viticultural areas and certain vegetables such as your famous Vidalia onion-growing region in Georgia. The *terroir* is a sign of the richness and diversity of the foods we eat and the way we produce them.

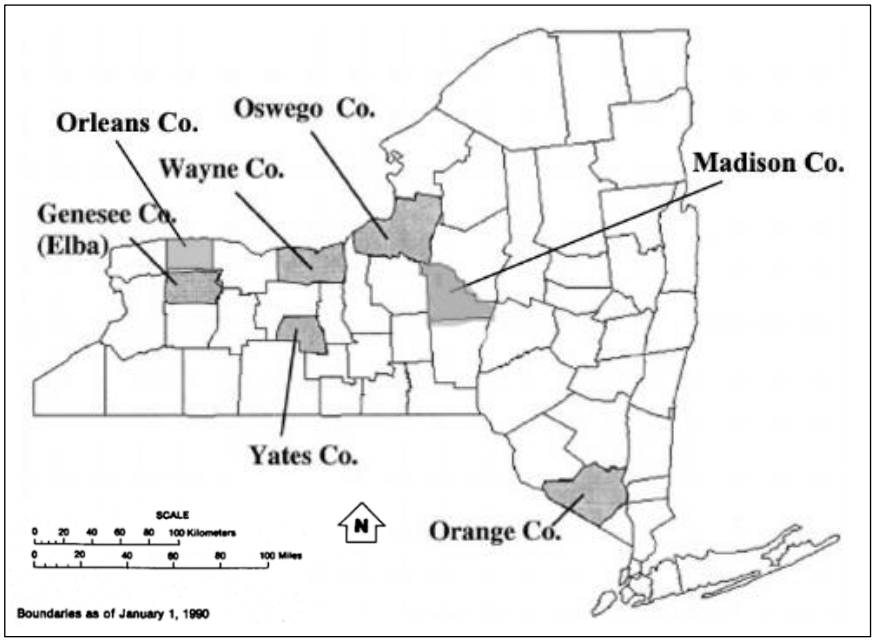
In my recent one-year stint in New York state as a visiting scholar at Cornell University, I learned about the *terroir* of New York's famous black dirt onion. Onions in the state are primarily grown on muck (organic) soils found in five counties: Orange, Oswego, Genesee (Elba), Wayne, and Yates (see Photo 1 and Map 1). Onion production also exists on a smaller scale in Madison, Orleans, and Steuben counties. The muck soils were formed as the mile-thick Laurentian Ice Sheet retreated 12,000 years ago, creating a landscape pocked with depressions that filled with meltwater. Aquatic plants flourished and decayed over the millennia and formed vast mucklands, which early European settler farmers discovered was ideal for growing certain vegetables: onions, celery, and potatoes. Known colloquially as "black dirt," these areas are among the most productive and lucrative farmland in the Northeastern United States.

What makes New York black dirt onions taste special

Photo 1. Black Dirt Soil in New York State

Photo by Philippe Jeanneaux.

Map 1. Locations of Muck (Black) Soil in New York State (by County)



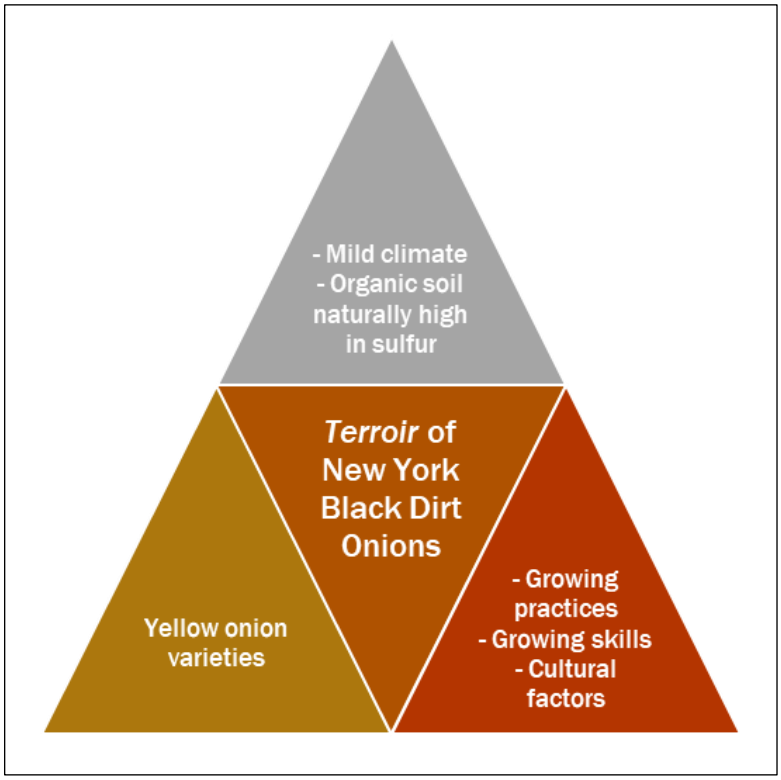
is the high sulfur content of the soil and thus of the onions. Growing in thousands of years' worth of composted vegetation increases the pyruvic acid levels in the onions, resulting in a bold, pungent taste when raw. The high sugar and low water content yields a pleasantly sweet and a slightly spicy flavor when the onion is cooked. The growing season is limited, and so black dirt onions have a natural seasonal availability. Therefore they are not common; they are very special—just like Brittany's Roscoff onion. My conceptualization of New York's black dirt onion *terroir* is found in Figure 1.

New York's Black Dirt Onion in a "VUCA" World

Despite its advantages, New York state black dirt onion production is in a major decline. Indeed, the situation for all U.S. onion growers is challenging in an increasingly "VUCA" world—a world that is simultaneously volatile, uncertain, complex, and ambiguous. Onion growers, depending on their geographic location, have developed different strategies to deal with increasingly tough competition. In Idaho, Oregon, and Washington state, large growers have chosen to develop a price competitiveness advantage. In contrast, others have built a differentiation strategy based on a premium branded onion linked to *terroir*, such as the Vidalia onion industry in Georgia. A third group of onion growers has not chosen between these two strategies; this group has not collectively and locally established a shared vision that takes their strengths, weaknesses, threats, and opportunities into account. By default, this group is taking the low-price route.

I suggest that this is the case for the New York onion industry. The problem is that the state's onion growers are not cost competitive, and their position in the marketplace has declined. In 2002—21 years ago—114 farms of more than 5 acres in the state produced 11,400 acres of onions. However, in 2017, only 50 onion growers with more than 5 acres produced 95% of onion production, with 6,400 acres. During this time, the number of growers and the acreages have been cut approximatively in half.

Figure 1. The New York Black Dirt (Pungent) Onion *Terroir* Triangle



Unlike U.S. onion production as a whole, the loss of harvested acres has not been fully compensated by a strong yield improvement; for the last 50 years, onion yields per acre have increased more slowly in New York than elsewhere in the U.S. Since 1970, New York has experienced a yield gain of 1.5 cwt/acre/year, compared to the total U.S. yield gain of 5.4 cwt/acre/year (using data from the U.S. Department of Agriculture National Agricultural Statistics Service [USDA NASS]).[1] Over the last decade (2010-2019), the total U.S. onion yield averaged 516 cwt/acre, while it was 304 cwt/acre during the 1970s. In

[1] I drew on several data sources (terminal market, shipping point, etc.) to create the database on which I based my analyses. I can provide the database to any interested reader; contact me at philippe.jeanneaux@vetagro-sup.fr

comparison, the New York onion yield averaged 325 cwt/acre from 2010-2019, while it was 283 cwt/acre during the 1970s.

Some observers have argued that Canada subsidizes its onion growers, causing serious injury to New York growers' ability to obtain favorable prices for their product. I have exhaustively analyzed Canada's export policy and found that there is no evidence to support this allegation. As far as I can tell, there are no subsidies to Canadian onion growers that would alter the price and create an unfair competitive advantage for Canadian exporters.

It is true that Canadian yellow onion imports are direct competition, but there is also secondary and indirect competition coming from sweet onions year-round. And this competition comes from fellow American growers. Because sweet onions are becoming a generic all-purpose onion for fresh eating and cooking, sweet onions now compete with pungent onions. The largest U.S. growers and shippers of sweet onions have established production in Mexico and Peru and have become exporters of onions to the U.S. to meet consumer demand year-round.

New York Black Dirt Onion Growers Are in a Low-Price Trap

To more fully understand the scale and scope of the decline of New York onion production, I conducted an econometric analysis that is included in a report published in the Department of Global Development at Cornell University (Jeanneaux, 2023). My research on price transmission suggests that the drivers of this decline in New York black dirt onion production are imperceptible from year to year, but over time have eroded New York's once-powerful onion industry. In my view, New York onion growers have become links in a supply chain where they sell a generic onion like a commodity.

Using econometric tools and data from USDA Agricultural Marketing Service, my report shows that the yellow onion market in the Northeast U.S. appears to run correctly, without competitive distortions. Growers and handlers try to compete with other onion supply chains that have better productivity and lower production costs. To maintain their onion market shares, New York onion growers generally use a single driver: low price. During the period 2011–2020 in Northeast U.S. region, the retail price of yellow (pungent) onions decreased from US$1.06 to US$0.90 per pound in current prices. However, to reduce the price to consumers, retailers have reduced their share of the value. At the beginning of the period (2010/2011), retailers received about 72% of the total value, and by the end (2019/2020), this portion declined to 63%. Retailers lost nine percentage points on average. Four percentage points have been captured by secondary handlers and five percentage points by first handlers-growers. At the end of the period, when consumers paid US$0.90 per pound, 23 cents went to growers-first handlers, 7 cents to second handlers (packers), and 60 cents to retailers. These results contradict any notion that retailers have increased their profitability at the expense of growers and handlers.

In fact, what retailers are doing is using the well-known "loss leader" strategy. Onions are a staple product in constant demand, but retailers do not use them to make profit; they are selling them at or below cost to attract customers (e.g., via promotional price discounts); they make up for this loss with slightly higher prices on other produce items, like brussels sprouts. But retailers will only accept a certain level of loss, and the net result for New York onion growers is that they are caught in a low-price trap.

Within this low-price trap, there is price volatility, suggesting that there is no volume control in the supply chain. Volatility can lead to asymmetric price transmission (the process by which upstream prices influence downstream prices and vice versa). However, my analysis shows no asymmetric price transmission or market power on either the grower-handler or retailer sides. In the long run, shipping prices, terminal market prices, and retail prices move together. Moreover, I found that shipping prices drive the terminal market price, and the latter drives the retail price. Indeed, first and second handlers operate as if they were price makers—even if it is a low price. A summary of the key findings of my report are found in the Appendix of this article.

Breaking Out of the Low-Price Trap

I recommend that, like growers in the Vidalia onion region, New York onion growers transition at least a portion of their production from the current unprofitable *supply* chain to a new value-added marketing strategy based on a black dirt soil *terroir* to create a new, more profitable and sustainable *value* chain. The concept of a "value chain" was pioneered by Porter (1985) to describe the complete range of business activities that are required to bring a product or service from conception through the different phases of production, distribution to consumers. As the product moves from one stakeholder in the chain to another, it is assumed to gain value (Hellin & Meijer, 2006). Bloom and Hinrichs (2011) argue that social relationships are critical to the success of value chains. They cannot simply be transactional. There should be a deliberate commitment to non-economic goals in order to establish successful mechanisms of interorganizational coordination.

Stevenson et al. (2011) showed that midscale food value chains are built on three foundations: (1) appropriate volumes of high-quality, differentiated, market-engaging food products, coupled with value-adding stories of people, land, and practices—which are the key local components of the concept of *terroir*; (2) strategic business partnerships based on trusting, transparent, and win-win relationships; and (3) effective supply-chain management and logistics, including product marketing, aggregation, processing, distribution, and accounting. This new approach would require investment and a formal recognition of the shared advantages the New York black dirt onion growers have: unique soil, climate conditions, local onion varieties, history and traditions, and know-how.

From my point of view, the New York Bold onion brand that was cooperatively marketed years ago is actually the best way to differentiate the state's special black dirt onions and turn this situation around. This will require trust-building between growers, handlers, and retailers and a level of transparency through the value chain. But with some of the largest markets for pungent onions in North America just hours away from these growing areas, a collaborative effort between all the stakeholders in this new value chain could reverse all of their fortunes. It is possible that the state of New York could help in branding and marketing and for the USDA to help establish a federal marketing order if the onion growers and handlers decide to work together to develop a collaborative onion brand. This opportunity remains possible as long as there is local production. If New York black dirt onion production disappears, the product is lost forever. There is no substitute for a local product, which is linked to the skills of local producers, its heritage, and its climate and soil.

To illustrate the potential, I conducted two economic impact studies of New York's onion industry. In the first study, I estimated the economic importance of the New York onion industry by modeling a fictitious change in which the onion growers shift production to grain crops such as corn. That is, the farmers stop growing onions and plant corn instead. In this scenario the onion industry would lose US$41 million gross output and 472 jobs throughout the New York economy. Even as it shrinks, the onion industry is a vital contributor to the state.

In a second study, I modeled a scenario in which the existing onion growers market their New York black dirt onion in a branded value chain. In this model, the onion growers work with handlers and retailers to produce and market high-quality onions (the choicest onions each year) at a premium price point for chefs and gourmet culinarians seeking to spice up and sweeten their dishes. For this model, I assume that most of New York state's 7,200 acres of onions are receiving a premium price at the farm gate, which rises by 35% (this is the difference observed between a standard onion and a premium onion such as Vidalia). However, a non-marketable quantity has been considered to reflect reality more accurately, as part of the production does not reach the quality required by customers. In this scenario, growers are able to generate additional gross sales of US$15.2 million and 185 new jobs in the state. Thus, there is the potential for significant new income with a transition to a value-added approach, and there is the potential for significant income loss if the decline on the onion supply chain continues.

In addition to this impact analysis, I have developed a budgeting tool for New York onion farmers to use to help in making the decision to transition a portion of their onions to a new value-added onion brand.[2] In this tool, growers can play with cost and price scenarios to see for themselves whether participating in a new value chain is more profitable.

New York Onion Growers Are Interested in Organizing

In conclusion, my report sheds light on the complexity of the onion industry in the U.S. The analysis at the farm gate and at the scale of the onion industry in New York state shows that there is potential to develop a profitable new value chain. The key challenge is for growers and handlers to believe in their strengths and seize the opportunity.

To that end, a small group of New York onion growers begin meeting in 2020. With the support of the AgriCluster Retention and Expansion (ACRE) project, led by the Thomas A. Lyson Center for Civic Agriculture and Food Systems,[3] these onion growers drafted the following vision statement:

> New York Black Dirt Onion industry will command a special market segment where consumers value a unique product. This segment provides increased profit, protects competitive advantage, and resiliency/vitality/vibrancy/well-being for growers and all constituents/members of the value chain.

With technical assistance and financial support from the state of New York and the USDA, I believe the New York black dirt onion growers could achieve this vision. The economic impact analysis alone suggests that the state of New York might consider making investments in assisting the remarkable black dirt onion industry to capture the low-hanging fruit waiting to be harvested. It is clear to me that both taxpayers and onion lovers will benefit.

Acknowledgment

This work would not have been possible without the help of Duncan Hilchey, co-director of the Thomas A. Lyson Center for Civic Agriculture and Food Systems and editor-in-chief of the *Journal of Agriculture, Food Systems, and Community Development* (JAFSCD).

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[2] This is an Excel spreadsheet to map out all the possible alternatives for onion growers' choices. If you would like to receive this Excel spreadsheet, please contact the author at philippe.jeanneaux@vetagro-sup.fr.

[3] The Thomas A. Lyson Center for Civic Agriculture and Food Systems (https://lysoncenter.org) is a fiscally sponsored project of the Center for Transformative Action (http://centerfortransformativeaction.org), a nonprofit affiliate of Cornell University.

Appendix. Highlights from the Report *Analysis of the U.S. Onion Industry with a Focus on New York State Issues*

1. The United States is a major onion producer worldwide, producing 3.2 million tons annually.

2. Increased demand for onions and stagnating domestic production in the U.S. led to a trade deficit due to imports from Mexico and Peru. In 2019, U.S. onion imports totaled US$431 million, US$195 million more than exports. The largest growers and shippers of sweet onions in the U.S. have expanded onion production outside the U.S. and have become exporters to the U.S.

3. The top competitors to U.S. onion growers are probably U.S onion growers who control farms in Peru and Mexico.

4. Contrary to popular belief, low-priced Canadian onion exports have not flooded the U.S. domestic market or injured New York State onion growers.

5. The analysis reveals that subsidies (which are significantly low) to the Canadian onion industry have not changed the price or created an unfair competitive advantage for Canadian exporters.

6. In 2019, New York produced 3.2% of domestic onions, compared to 20% in 1960.

7. Based on the data analysis presented in this report, I believe the yellow onion market in the Northeast U.S. runs as it should, without competitive distortions. First and second handlers seem to operate as price makers, even if it is a low price. These handlers compete with other onion supply chains that have better productivity and lower production costs. To maintain their share of the onion market, handlers use a single tool: low price. If there is volatility, it is because growers do not control the onion supply.

8. Contrary to common belief, my research shows that consumer onion prices have not increased, while wholesale buyers and farmers have received slightly higher prices over the past 10 years. The retail price of the yellow globe onion has decreased since 2011 to US$0.90/pound in 2020, a 16% decline. A similar trend has been observed for yellow sweet onion (−10%), even if this onion has a better price than a yellow pungent onion.

9. Because of their cooking flexibility, large Granex sweet onions may be cutting into the demand for pungent onions. The New York onion acts like a commodity rather than a specialty crop. New York onion growers are involved in a cost-competitiveness strategy rather than a differentiation strategy (such as the Vidalia onion industry uses). However, New York growers are neither competitive as they were not on the relevant market.

10. A cost/benefit analysis at the farm gate suggests that, depending on the unique circumstances of individual farms, there is the potential to produce and market premium yellow onions on the remaining onion growers' farms in New York state. Indeed, at the farm gate, turning the black dirt onion business model into a branded premium onion is profitable. An economic impact analysis using IMPLAN™ software shows the importance of the New York onion industry in terms of gross output, labor income, job creation, and value added prices.

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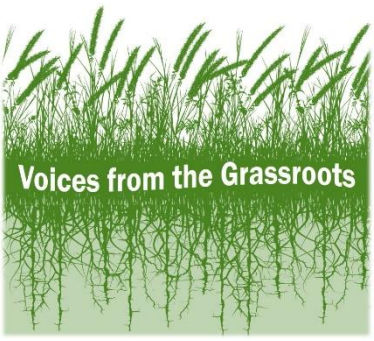
VOICES FROM THE GRASSROOTS COMMENTARY

Examining the history of trust within Appalachian coal camps



Angel Smothers [a] *
West Virginia University School of Nursing

Kristen Goins [b]
McComas, West Virginia

Tanner Cole [c] and Jaylyne Morgan [d]
West Virginia University School of Nursing

Erin Young [e] and Kylie Young [f]
AmeriCorps VISTA

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In the last few decades of the 19th century, towns and settlements were sparse in the Appalachian Mountains. Due to this isolation, a culture of solitude and self-reliance developed, affecting the economic status of the area (Gabriel, 2014). Coal companies established numerous towns known as coal camps, exerting tight control over them. Consequently, community members of these coal camps relied entirely on the mining companies for survival. This dependency contributed to the region's decline; as coal lost its dominance and work diminished, economic opportunities also vanished.

While trust is crucial in anyone's life, it seems to have a higher significance in the Appalachian Mountains and particularly to those who live in coal camps, due to the region's history. Outsiders

[a] * *Corresponding author:* Angel Smothers, DNP, APRN, FNP-BC, West Virginia University School of Nursing; 64 Medical Center Drive HSC South, 6th Floor; Morgantown, WV 26506 USA; asmothers@hsc.wvu.edu

[b] Kristen Goins, Coal Camp Community Insider and Leader, McComas, West Virginia; kristengoins1210@yahoo.com

[c] Tanner Cole, BSN, RN, MSN Student and Graduate Assistant, West Virginia University School of Nursing; tgc0003@mix.wvu.edu

[d] Jaylyne Morgan, BSN, RN, MSN Student and Graduate Assistant, West Virginia University School of Nursing; jlm00065@mix.wvu.edu

[e] Erin Young, MS, BA, AmeriCorps VISTA; eny0003@mix.wvu.edu

[f] Kylie Young, BS, AmeriCorps VISTA; key0006@mix.wvu.edu

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to those living in the camps are not typically received well, and there are many areas in which the concept of trust should be examined for these people. Environmental, social, and economic trust are areas to be explored as there is a rich and unique history pertaining to each of these. Working with someone who is trusted within the coal camp is imperative for fostering a more trusting relationship with outsiders, including social, environmental, and economic establishments and changes that they might want to bring. Many coal camp communities are considered food deserts. There is limited access to fresh fruits and vegetables, making it very important for these communities to be equipped to grow more of their own fresh fruits and vegetables. Connecting a faith community nurse within coal camps in Appalachia could prove a successful way to enhance trust in community members and facilitate support for accessing fresh fruits and vegetables. We developed a team approach where a nurse who is considered a community insider works with a layperson leader from within the rural coal camp community. To address concerns for limited access to fresh fruits and vegetables, we identified strategies to address the overarching issue of a lack of trust that many rural community members feel. Some community members have concerns about food that comes from outside sources. The faith community nurse and other community insiders have been able to educate community members and support them in overcoming these concerns.

The Connection Between Culture and Trust in Appalachia

Understanding trust in Appalachia is complex, as it differs from the rest of the nation. Many residents live in conditions characterized by poverty, depression (both psychological and/or economic), and suspicion related to a long-term history of exploitation. Appalachians are often reluctant to accept help from people coming in from outside their region. Most have long drives to reach a grocery store, which has resulted in the consumption of canned foods over fresh fruits and vegetables. Regarding health information, they rely heavily on nurses, doctors, and websites (Myrick & Hendryx, 2021). Traditional media is not deemed trustworthy, which presents risks when disseminating information during global health crises. In addition, the remoteness from primary-care providers poses challenges in accessing trustworthy health information (Hu et al., 2022).

Cultural values and norms deeply influence trust among Appalachians. Most community members value their faith in God and emphasize independence and self-reliance. Even community members who do not consider themselves religious will speak of their trust in God. The family is also paramount. Many individuals stay within their community even after establishing their own families, leading to isolation from broader national dynamics. This rurality often results in a preference to depend on family rather than outsiders. Often, those people who remain in a coal camp are closely or distantly related. Despite these challenges, coal mining remains a prevalent occupation in Appalachia (Poudyal et al., 2019).

Trust Within Coal Camp Communities

Distinct from most places in the United States, coal camp communities are generational homes. A generational home in Appalachia is when multiple generations of a family live in the same home, or within a mile of each other. Often in rural Appalachia we see older adults sharing their homes with their children, grandchildren, and even great-grandchildren. Residents are more inclined to trust someone within the community than those from other locations, even if those people are well educated. They have seen each others' children grow and have shared life events. Trust is paramount due to the isolation of these coal camps (Russ, 2010). For outsiders, trust and respect are hard-earned. The most successful advocates for these communities are often those born there.

Proposals for change are taken seriously when they originate from someone with community roots. This trust extends to professionals like nurses who are insiders in the community (Canterbury, 2019). Due to limited transportation, it is common for rural community members to stock up on nonperishable food for the long, cold winters. During these times, most community members consume very small amounts of fresh food. We were able to work as a team to develop nutrition-based interventions including education and

community garden development. Two of the authors of this article are considered community insiders in one Appalachian community, and we also were able to identify other community leaders to support our work. This helped to overcome some of the trust barriers that are commonly seen in Appalachia.

Trust and Economic Relationships

West Virginia is the only state that is fully located within the Appalachian region. Starting in the 1880s, large external companies acquired land throughout West Virginia for coal mining (Corbin, 2015). The companies constructed towns for mine workers, controlling housing, stores, post offices, churches, and schools. Unlike stores outside the camps, these company-owned outlets accepted scrip, a form of currency paid to miners, enabling the company to dominate the local economy. The control extended to monitoring mail, stifling political activity, and preventing unionization, sometimes resulting in violence and armed conflicts (Corbin, 2015; Stevens & Fogel, 1999).

Despite its tumultuous history, coal mining has shaped a distinct culture, with many perceiving mining as superior to other occupations. For many Appalachians, coal represents the only path to economic independence, and they view environmental regulations as external threats to their livelihood (Lewin, 2019). However, the industry's decline is primarily due to the rising demand for natural gas and other forms of energy and to decreased productivity in central Appalachian mines, not to solely environmental policies (Appalachian Regional Commission [ARC], 2011; Bowen et al., 2018).

Trust and Environmental Concerns

Mining and industrial pollutants have been linked to higher rates of diseases in nearby residents (Hendryx, 2018). Although entities like the U.S. Environmental Protection Agency regulate the industry to curb pollutant release (Harvey, 1986), many residents blame these regulations for mining's decline, overlooking other market contributors (Bowen et al., 2018; Lewin, 2019). The downturn has profoundly affected Appalachians in the industry, with many mines closing since 2008 (Berry, 2021).

There is a profound mistrust of the government among Appalachians that affects their willingness to engage in environmental programs (Scott & McSpirit, 2014). Building trust around environmental issues is critical for change. Community-based educational initiatives and involving local stakeholders can alter perspectives and cultivate trust, as seen in the University of Tennessee's clean water project (Arcipowski et al., 2017).

Trust and Social Services

Trust in social services and government assistance in Appalachia has been influenced by historical exploitation and negative external views. Challenges in employment and social issues, often highlighted by media stereotypes, have undermined trust. Although many residents have benefited from these programs, there is a need for a more collaborative approach involving local communities in program design and implementation to ensure that their needs and voices are heard (Kauffman-Craig et al., 2014). Education and awareness campaigns are crucial in countering myths and showcasing the positive impacts of these services. We used a team approach where community insiders served as leaders in addressing limited access to fresh fruits and vegetables through identifying concerns with trust among residents of the rural Appalachian communities we worked in.

Trust, Change, and Transition

Despite the coal industry's decline, distrust persists among West Virginians toward governmental agencies and outsiders, who they feel prioritize environmental concerns over residents' well-being (Lewin, 2019). Building trust is a nuanced, time-consuming process, essential for successful community revitalization. Addressing power imbalances and ensuring open, respectful dialogue can foster a collaborative atmosphere (Nixon et al., 2023; Savage et al., 2018). Demonstrating genuine efforts to prevent exploitation and support the region is key to building trust (Lewin, 2019). Strategies for gaining trust are outlined in Table 1. We identified and used these strategies to help address fear and lack of trust among the residents of the communities we worked in. These strategies are things that we use with any new

Table 1. Strategies for Gaining Trust in Appalachian Coal Camps

Strategies	Description
Engage in Active Listening	Actively listen to community members' concerns, perspectives, and needs. Show empathy and validate their experiences.
Build Relationships and Establish Rapport	Take time to build relationships with individuals and community leaders. Participate in community events, volunteer, and show genuine interest in their well-being.
Promote Transparency and Open Communication	Foster transparency by providing accurate information, sharing updates, and addressing questions and concerns openly.
Involve Local Community Members	Engage local community members in decision-making processes, planning, and implementation of programs and initiatives. Ensure their voices are heard and valued.
Collaborate with Local Organizations	Establish partnerships and collaborations with local organizations, community leaders, and service providers to leverage resources and collective expertise.
Demonstrate Cultural Sensitivity	Understand and respect the unique cultural heritage and traditions of rural Appalachia. Tailor programs and services to be culturally sensitive and inclusive.
Deliver on Promises and Commitments	Follow through on commitments and promises made to the community. Consistently deliver high-quality services and support.
Be Consistent and Reliable	Establish a consistent presence and follow regular schedules. Build trust by being reliable and dependable in providing assistance and support.
Address Historical Context and Stereotypes	Acknowledge and address historical context, stereotypes, and negative perceptions associated with Appalachia. Work to dispel misconceptions and build a positive image.
Emphasize Long-Term Sustainability	Demonstrate a commitment to long-term sustainability by investing in ongoing support, programs, and initiatives that benefit the community in the long run.

project we plan and/or implement in rural communities.

Conclusion

Past exploitations and stereotypes make Appalachians wary of external assistance. Including trusted community members in planning and valuing their insights is critical. Community concerns must be central to decision-making. Identifying ways to improve access year-round to fresh fruits and vegetables may be key to addressing many residents' lower-than-average health-related outcomes that center around a diet that lacks good nutritional value and limited physical activity. We have been able to use the strategies we identified to support community members where they are and make progress toward building trust. Working within these communities through building insider leadership and support is a good method for improving access to nutritional education and fresh fruits and vegetables. Nevertheless, more research is required to understand trust's role in developing former Appalachian coal camps. Evidence suggests that trust is crucial for sustainable community development by enhancing communication and collaboration. Fostering trust is central to improving Appalachian lives and should be a cornerstone of development efforts; the insider role of nurses in rural Appalachia is invaluable and should not be underestimated.

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Growing in relation with the land: Experiential learning of Root and Regenerate Urban Farms

Chelsea Rozanski [a]*
University of Calgary

Michael Gavin [b]
Root and Regenerate Urban Farms

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Abstract

The food landscape of Calgary, Canada, is sown with an abundance of polycultures. Alongside place-specific Indigenous foodways are food rescue, banking, and hamper programs, food studies scholars, a City of Calgary food resilience plan, and a growing number of alternative food network producers. Within the local alternative food network, there has been a boom in advancing indoor growing for our colder climate, including container, aquaponic, vertical hydroponic, and greenhouse growing. Situated as an agrarian ethnographer and an urban regenerative farmer, we seek to highlight the viability of agricultural techniques that are in relation *with the land* to grow more

[a] * *Corresponding author:* Chelsea Rozanski, Ph.D. Candidate, Anthropology, University of Calgary; 2500 University Drive NW; Calgary, AB, T2N 1N4, Canada; +1-403-483-2688; chelsea.rozanski@ucalgary.ca

[b] Michael Gavin, Owner and Operator, Root and Regenerate Urban Farms; 4411 Manitoba Road SE; Calgary, AB, T2G 4B9, Canada; +1-587-215-1707; michael_gavin77123@hotmail.com

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Second author Michael Gavin is the owner and operator of Root and Regenerate Urban Farms, and is therefore self-employed and financially invested in his agricultural business.

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socially and ecologically sustainable food and farm systems in and around Calgary. From this position, we formed a collaboration between the University of Calgary, Root and Regenerate Urban Farms, and the Young Agrarians to document the cultivation process for a production urban farm. Over the course of one growing season—May to September, 2021—we harvested approximately 7,000 lbs (3,175 kg) of produce across nine urban spaces totaling 0.26 acres. The 48 vegetable varieties were distributed to 35 community supported agriculture shareholders, weekly farmers market customers, restaurant chefs, and members of the YYC Growers and Distributors cooperative. Moreover, we donated 765 lbs (347 kg) of surplus produce to the Calgary Community Fridge, Calgary Food Bank, and the Alex Community Food Centre, which work to mitigate food insecurity. Through a reflexive practitioner approach, our reflective essay discusses the benefits and limitations of Small Plot Intensive Farming methods and urban land-sharing strategies, as well as the viability of land-based urban agriculture in a rapidly changing socio-ecological climate. Our paper also demonstrates the potential for transcending siloed approaches to knowledge-making vis-à-vis experiential learning partnerships between graduate student researchers, farmers, and agricultural organizations.

Keywords
regenerative farming, urban agriculture, small plot intensive farming, SPIN farming, alternative food network, food system resilience, land sharing, experiential learning, activist scholarship

Introduction

Guided by a set of dynamic principles, regenerative farming uses a combination of complementary and adaptive techniques in order to rebuild soil health and fertility, increase water percolation and retention, enhance synergetic biodiversity and ecosystem health, recycle nutrients and energy, reduce carbon emissions and atmospheric CO_2 levels, and minimize the use of agro-chemical and energy-intensive inputs (Altieri et al., 2015; McKay, 2012). Processes of regenerative agriculture may include crop and intensive livestock grazing rotations, multi-species cover cropping, chopping and dropping, minimal tillage, integrated livestock and pest management, and the integration of native plants and pollinators (Horrigan et al., 2002). Although these methods are most often operationalized in rural settings with broader swaths of land, a growing number of urban agrarians are finding creative ways to incorporate regenerative techniques into their practices.

To deepen our understanding of the possibilities and challenges for regenerative cultivation in and around Calgary, we formed a partnership between the University of Calgary's Department of Anthropology and Archaeology, Root and Regenerate Urban Farms,[1] and the Young Agrarians (YA). Connecting the Western provinces of British Columbia, Alberta, Saskatchewan, and Manitoba, YA is a "farmer to farmer educational resource network for new and young ecological, organic and regenerative farmers in Canada."[2] Formerly housed under the nonprofit Organic Alberta, YA is now a program of the Agrarians Foundation, a charitable organization that provides public education on agriculture, community development, and environmental sustainability. In addition to networking events, farm tours, business bootcamps, land access programming, and reconciliation training for farming communities, YA offers an annual Apprenticeship program that matches aspiring farmers with mentors to hone their farming philosophy and techniques.

Funded by a Social Sciences and Humanities Research Council (SSHRC) Vanier Canada Graduate Scholarship and a University of Calgary Faculty of Graduate Studies Transformative Talent Scholarship, we established a mentor-mentee partnership from May to September 2021 to document the processes, barriers, and opportunities of small plot intensive (SPIN) farming in Calgary. Primarily practiced in urban centers with low-impact technologies, this farming technique utilizes consecutive planting, intense rotations, and close proximity of crops to one another to allow for a large amount of food to be grown in small spaces, thus maximiz-

[1] https://www.rootandregeneratefarm.ca/
[2] https://youngagrarians.org/

ing productivity. We asked: how and to what extent can urban farmers employ land-based regenerative practices to grow food for a local alternative food network (AFN)? How can experiential learning partnerships between graduate student researchers, farmers, and agricultural organizations support more socially and ecologically sustainable food and farm systems in Southern Alberta?

Although Calgary's AFN (see Rosol & Barbosa, 2021, for more on AFNs) has experienced a beneficial boom in advancing indoor growing for our colder climate—including container, aquaponic, vertical hydroponic, and greenhouse growing—we seek to highlight the viability of agricultural techniques that are in relation *with the land* to grow food, ecosystem resilience, and community. We intentionally use the term "with" the land, as opposed to "in" or "on," to demonstrate the relationality between growers and landscapes, as well as to reflect our application of "no-dig" agriculture. The three main principles of no-dig include not tilling to minimize soil disturbance, covering the soil as much as possible, either with living plants or mulch, and leaving the roots of crops in the soil after harvest. The scope of this essay does not address conventional practices that rely solely on cultivating "in" the soil, nor does it discuss indoor operations that sit atop the land. We recognize that overlaps exist between these practices and that it is important to disrupt the notion of isolated silos within food studies discourse, research, producer certifications, and consumer marketing. Nevertheless, framing our experience as growing in relation *with the land* best spoke to the values and approaches of our work.

Along with companion planting, crop rotation, and natural pest management, we employed SPIN farming techniques in household yards, on an apartment rooftop designed by Calgary-based Modern Office of Design and Architecture,[3] between offices in the city core, and among green spaces adjacent to businesses and buildings (Figure 1). Over the course of five months, we collected data on the growing spaces, seeding and management practices, yields, and distribution streams for Root and Regenerate Urban Farms.

To evoke the multiple senses of experiential learning with the land (Francis et al., 2011; Parr & Trexler, 2011; Wiedenhoeft et al., 2003), the next section will include a land acknowledgement and two reflective vignettes. Following the seasons, Michael Gavin will take readers behind the scenes of an urban farming business. Chelsea Rozanski will then focus on a day in the field—both ethnographically and agriculturally—through the lens of an agrarian anthropologist. In the subsequent section, we will situate our experiential learning research on urban agriculture in Alberta's food landscape and in broader grassroots movements seeking socially and ecologically resilient food and

Figure 1. Cultivating on an Apartment Rooftop (Left) and an Urban Business Space (Right)

[3] https://www.canadianarchitect.com/growing-together-grow-calgary-alberta/

farm systems. Our reflective essay will conclude with an acknowledgement of our limitations, recommendations for future research, and the overall significance of regenerative urban farming efforts in rapidly changing environmental and political climates.

Reflections on Regenerative Farming in an Urban Context

Before we sow seeds and harvest yields, we offer gratitude and acknowledge those who have stewarded the lands and waterways of Southern Alberta for generations. This region of Turtle Island is the traditional territory of the Blackfoot Confederacy, who include the Siksika, Piikani, and Kainai First Nations; the Tsuut'ina First Nation; and the Ìyethka Nakoda, including the Chiniki, Bearspaw, and Goodstoney First Nations. Calgary is also home to the Métis Nation of Alberta, Region III. Inuit and Indigenous Peoples, newcomers, and visitors from around the world also live, work, and play as members of Treaty 7. Relying upon the waters, soils, and pollinators of Calgary (Mohkinstsis [MOH-kin-stsis] in the Blackfoot language) to grow plants for foods and medicines, we situate ourselves and this research within the legacy of colonialism. As authors of European ancestry, we have been privileged to learn and cultivate at the historical displacement of Indigenous Peoples (Aldern & Goode, 2014; Carter, 1990; Kepkiewicz, 2015; Kepkiewicz & Dale, 2019; Matties, 2016). We acknowledge that the only voices we can represent are our own and take responsibility for any misrepresentations in this reflective essay.

Urban Ag Through the Seasons: Vignette by Michael Gavin

The growing season in Calgary officially begins while the snow is still flying in this area. The winter months offer a rest, but also a time for preparing and planning for the upcoming season. Farming at any scale, one's tools, equipment, seeds, and materials need to be inventoried, assessed, and replaced as needed. Taking stock of equipment and tools starts at the end of the season, around late October, when winter approaches and we put everything away. For things like Remay, a cotton and synthetic fabric blend used to protect plants from frost and insects, we measure the lengths, check for holes, and replace as needed. This goes for all the different parts that make up intensive farming operations, such as irrigation components, starter trays, and the like. In December, we start ordering materials. This is when the farm expenses are the greatest. We replace supplies and repair equipment, take stock of what we need to grow, and collect membership fees needed to purchase the necessities to grow food in the summer. Programs such as community supported agriculture (CSA) are invaluable in helping offset some of these early and expensive purchases with pre-sold shares or CSA membership subscription fees.

The most important part of planning for the following season is done from December to January, when climate-sensitive crop designs are made for the season. With urban farming, plots and growing beds are not uniform, nor do they have equal conditions such as wind and light availability. This adds a certain level of complexity in planning that rural farms do not often have to factor in. All our planning is compiled on spreadsheets, using information from past growing seasons to create garden maps, action dates, volumes, and all the details needed to produce food at this intensive pace. This gives us a clear vision of how the season is going to look. Inevitably, the season will not go as planned (due to climatic conditions, human error, etc.). However, having this baseline plan allows us to adapt and refocus without being lost.

The first seedlings are planted indoors under lights at the beginning of March and hardened off in a passive solar greenhouse in April. From this time, the number of seedlings gradually increases to a peak around the first two weeks of May. At this point, the shelves in my office are bursting with seedlings waiting to be transplanted in unfrozen soil. Transplants will continue to be produced and planted through the middle of August, though in lower quantities. From April to May is when we also complete most of our outdoor plot preparation. Beds are cleared of winter covers and old plant debris, which are added to the farm's compost, and gently loosened with a broadfork. Compost is added to the topsoil, and drip irrigation is installed for increased water conservation. This

period requires a lot of multitasking, as other projects need to be completed concurrently, such as greenhouse construction and repairs to coolers, fences, and compost bins. Some crops and flowers are directly seeded during these weeks, but most transplants will not be planted until the middle of May.

Mid-May to mid-June is a particularly busy period, with thousands of plants transplanted and many rows directly seeded (Figure 2). Some plants need special care to protect them from harsh spring conditions, while other plants are being attacked by flea beetles, a major pest. Covering the plants with Remay fabric can help on both counts, keeping pests away from plants and insulating them from the wind and cold. Come the latter half of June, we enter into a bit of a lull. Most crops are planted but not ready for harvest, giving us time to catch up on any weeding that may be needed. Harvest is underway by the end of June to fill our three major outlets: local farmers markets, a CSA, and wholesale markets. We continue with weekly plantings to maintain a steady vegetable supply. Farmers markets and CSA pickups are held multiple times a week for the next 15–17 weeks (Figure 3). Daily activities become more predictable and routine at this point, as we "rinse and repeat" the tasks that go into filling orders week after week.

As we approach the late season—end of September into mid-October—the rhythm changes once again. Crops are coming to completion with nothing to be replanted. This is when we start to put away irrigation and other equipment, cover beds with mulch, and cut down crop debris for

Figure 2. SPIN Farming in the Back and Front of Household Yards (Left and Right)

Figure 3. Distributing Produce at a Farmers Market (Left) and for CSA Members (Right)

compost. Odd jobs or new growing spaces are being completed; sales come to an end for our market, CSA, and wholesale distributor; and the season winds down until we reach one of the last jobs of the season. At the end of October to early November—depending on the forecast for snow and frost—we plant next year's garlic crop in the ground and keep it cozy with a thick layer of straw. After that, we relish the brief respite in November before starting the cycle again in December.

A Day in the Field for an Agrarian Ethnographer: Vignette by Chelsea Rozanski

"Trying to grow, yeah alright, trying to grow what's outside." The upbeat chorus by Canadian rock band, The Sheepdogs, rings louder as I groggily hit snooze on my 6:30 a.m. alarm. First task: brew coffee. Second task: toast a bagel for the road. I scoop a cup of kibble into a bowl and croak out, "Eat up, doggo. You're coming today, and it'll be a long morning." Water bottles filled, *check*. Granola bars and lunch packed, *check*. Sunscreen and brimmed hat, *check*. Pulling up my overalls with one hand, I open the weather app with the other. Full July sunshine with a high of 20°C (68°F); a chance of light showers in the afternoon. Hopefully it will pass before the 3:00 p.m. farmers market.

I load up my SUV with old pallets gleaned from the side of a dumpster. Tomorrow we will be expanding the outdoor compost system. "Up, up. Let's go buddy!" With my four-legged friend in tow, I set out on the road to meet Michael at one of the household yards. When we arrive, Michael is already pulling back the white row cover on the spinach (Figure 4). "Good morning!" I exclaim as I secure my pup a distance away from the garden under a tree. "Drink your water, bud. We will be working for the next hour or so." With a Rubbermaid bin, pruning shears, and a scale, we harvest the biggest leaves of each spinach plant. Filling the bins to the rim, we weigh them before stacking one atop the other into our trunks. Once finished, we slide the row cover back onto the metal hoops and stake it into the ground. "Not today, flea beetles!"

Ten minutes later, we park at the next plot, hop out, and go through a similar process with radishes. We begin pulling up the larger radishes from the base of the stem, tying bunches of five to six bulbs with a rubber band, and placing them in the bins. I run into a patch with compacted soil and use my Hori Hori knife to loosen the roots without cutting the plant. To our delight, we observe only a few bulbs with root maggot damage, which is to be expected in organic farming. Bending at the knees, I jigsaw the heavy bins between pallets and harvested spinach.

My stomach alerts me that it is now mid-morning. "Off we go, pup! Up!" Back in the car, I devour two Oats 'n Honey bars before arriving at the headquarters of Root and Regenerate Urban Farms. With the pallets unloaded, Michael and I begin shuffling the yields into a locked cooler so they don't wilt while we wash and package them

Figure 4. Harvesting Spinach (Left) and Drying Radishes (Right) for a YYC Growers and Distributors Bulk Order

for a YYC Growers and Distributors (YYCGD)[4] order. Taking off my shoes and socks, I fill one radish bin with water to soak while Michael sets up the sun-drying racks. Bunch by bunch, we hose any remaining soil off the plants and lay them out to dry (Figure 4). I close my eyes briefly to focus on the cool water between my toes, opening my eyes to a lapping sound on pavement. "Is that runoff water tasty? Ah, to be an agrarian researcher's dog!" Turning the radishes over periodically, we move into the cooler to bag spinach. Thirty minutes and 350 150g bags later (~115 lbs, or 52 kg, total), we are ready to pack up. While Michael reloads the dried radishes into clean bins and drives the orders to the YYCGD warehouse, I prepare for this afternoon's market.

Foldable tables and tablecloths, *check*. Whiteboard, markers, and moneybox, *check*. Tent, chairs, crates, and coolers, *check*. I go through the mental rundown: today we will be selling large bok choy, red Russian kale, collard greens, rainbow Swiss chard, carrots (with tops on and off), purple kohlrabi, fennel, turnips and radishes (bagged or with greens), green onions, cherry tomatoes, tatsoi, parsley, dill, romaine heads, and bagged lettuce, arugula, microgreens, and pea shoots. We will also have eggs available from Happiness by the Acre's pasture-raised hens and haskap berries from West Raven Farms. Michael returns, and we soak in the sunrays over lunch.

"Stop chasing the wild rabbits and come have a snack!" We pack up the cars yet again, drop the dog off at my house, and head to the market. By the time we finish setting up, the first market-goers trickle in. Today, a youth band is playing cover songs for the crowd. The scent of kettle corn mingles with our fresh produce, sending me into a stupor before a customer brings me back to reality.

"Excuse me dear, what are these, and how much do they cost?" she asks, to which I reply, "They are homegrown sunflower shoots." I tell her they're CA$4.50 a bag. She grabs three bags plus a bundle of carrots and a dozen eggs. Around 4:30 p.m., the crowd picks up, despite this morning's weather warning. So far, so clear. The market is more likely to get rained out in June, while July brings a steady chance of hail and heat. By 6:30 p.m., we've managed to sell most of our goods and commence the final pack-up for the day. En route to the container cooler, we drop off a donation of produce to the Calgary Community Fridge.

After an exhausting day, we go over plans for tomorrow's composting makeover and part ways. I get home, open the door, kick off my shoes, and flop onto the floor, too tired to make it to the couch. A friendly but concerned face trots over to give my head a sniff. "Well, pup, no one ever said urban farming was easy! Nor experiential research, for that matter. Let's get some food and rest for another big day ahead."

Harvesting the Yields

Over the course of the growing season, we grew approximately 7,000 lbs (3175 kg) of 48 vegetable varieties (Table 1) across nine urban spaces totaling 0.26 acres (1,052.18 m^2). This was roughly broken down into 3,015 lbs (1,368 kg) of 20 varieties of greens, herbs, and brassicas; 2,624 lbs (1190 kg) of

Table 1. Crops Grown by Root and Regenerate Urban Farms

Crop Category	Crop Types	Total Crop Yields
Greens, Herbs, and Brassicas	Arugula, basil, bok choy, broccoli, cabbage, cauliflower, cilantro, chives, collard, dill, kale, lettuce, lovage, mustard, microgreens, parsley, radicchio, spinach, Swiss chard, tatsoi	3,015 lbs (1,368 kg)
Roots and Below-Surface	Beet, carrot, celeriac, garlic, parsnip, potato, radish, rutabaga, sunchoke, turnip	2,624 lbs (1,190 kg)
Other Vegetables and Fruits	Bean, celery, cucumber, fennel, kohlrabi, leek, onions, pea, pepper, rhubarb, squash, strawberries, tomato, zucchini	1,075 lbs (487 kg)

[4] https://yycgrowers.com/

10 different root and below-surface crops; and 1,075 lbs (488 kg) of 14 other vegetables and fruits that were distributed to multiple outlets. These included a weekly farmer's market, YYCGD Harvest Boxes, 35 CSA shareholders, and several restaurant chefs. From mid-June to the end of September, an estimated 7,500 units of produce (i.e., 1 lb of turnips, 1 bunch of dill, 1 bag of spinach, etc.) were distributed to YYCGD, which came to 150–400 units per week, and 2,500 units were sold to the other outlets. While CSA members received a share of five to seven units per week, about 30 units of produce were sold at each market day. Located in the city's northwest quadrant, the Triwood Farmers Market serves the Brentwood, Charleswood, and Collingwood neighborhoods, which are mostly characterized by middle-income private households, according to The City of Calgary Community Profiles (n.d.).

Moreover, 765 lbs (9347 kg) of surplus produce were donated to social agencies that serve food-insecure populations and work to mitigate hunger, including the Calgary Food Bank and the Alex Community Food Centre. While we did not collect consumer demographics, our small urban farming operation contributed to the nourishment of roughly 300 individuals per week for a quarter of the year. Producing this quantity of food required roughly one and a half full-time employees. Root and Regenerate Urban Farms does not rely on volunteer labor to complete its work but welcomes those interested in hands-on learning to take part in plot building, planting, packaging harvests, and more. One to three days per month, we were joined by volunteers who were compensated in-kind with produce. Upon harvest, we calculated the total weight of yields. We also gathered crop- and climate-specific data for direct sowing versus transplant dates and ages, days to maturity for both sowing types, Jang Seeder roller sizes, and feet needed per unit based on space and depth of plants, rows, and beds (Table 2).

Additionally, we made observations of the diversity of pollinators (i.e., at least five Bombus species, and species of mason bees, leaf cutters, and other ground nesting solitary bees) frequenting blooming vegetables and flowers in the urban growing spaces. Flowers and medicinal plants that we sowed in the garden spaces included Comfrey, Delphinium, Lupin, Sunflowers, Tobacco, Yarrow, Aster, Strawflower, Calendula, Coneflower, Cosmos, Vetch, and Phacelia. We also collected information on water usage and retention using drip lines and hemp mulch on beds. We noticed a decrease in flea beetle and cabbage moth presence on plants under Remay, participated in soil sampling with YYCGD, and tarped new plots to suppress weeds for the subsequent summer. Our outcomes demonstrate the viability of growing food outdoors despite Calgary's climate, while

Table 2. Example of Crop Data by Root and Regenerate Urban Farms

	Arugula	Swiss Chard	Broccoli	Dill Leaf
Sowing type & Jang size	Direct (YYJ24)	Indirect	Indirect	Direct (MJ24)
Plants per 10 ft.	672	60	13	864
Plants per ft.	67	6	1	86
In row (in.)	1.25	6	18	1.25
Between rows (in.)	3	10	16	3
Rows in 30 ft. bed	7	3	2	9
Transplant age (days)	N/A	30	30	N/A
Days to maturity	38	60	69	50
Days to maturity with transplant	38	46	55	50
Planting dates	April 17–May 8	May 8–May 15	May 8–May 29	May 29–June 15
Feet needed per unit	0.5	0.5	0.75	0.7

building soil health and supporting native pollinators through strategic landscape design and land-sharing opportunities (Wezel et al., 2016).

Benefits and Barriers of Urban Farming with the Land

The growing spaces in which RRUF operates are obtained through partnerships with homeowners, businesses, and apartment managers. Accessing land is one of the biggest barriers facing aspiring agrarians, both in urban and rural settings. The ability to arrange land-sharing contracts, which can range from fully donated spaces to affordable leases or barter agreements, opens up the doors for urban farmers to actually make a living. Some homeowners opt for up to two CSA shares in exchange for the land provided. At RRUF's main plot, Michael provides landscaping and lawn care throughout the season. This arrangement is a fairly minimal burden for an urban farmer, though it can differ from contract to contract. Nevertheless, no-dig SPIN farming requires a high investment in resources (e.g., the compost and mulch that are brought in) and time (e.g. human labor, plant growth, the time it takes to regenerate soil biodiversity). Therefore, the lack of long-term security is a shortcoming of land-sharing where only one partner owns the land.

Michael faced this scenario in 2021, when one plot's homeowners moved and the new buyers wanted the gardens removed. A similar scenario happened to Leaf & Lyre Urban Farms, one of the first SPIN operations in Calgary. Although a plot's property owner had the intention of selling their house, the landlord and urban farmers (who had been building the yard's soil for several years) were not informed, so that the yard would continue to appear lush to potential buyers. "I felt used and frustrated, because I put in so much love and attention. I built a relationship with that soil over the course of years; I couldn't just leave it there," said Leaf & Lyre's owner Rod Olson, "I was never the one 'in charge' of the yards with which I built a relationship. There was always the feeling of uncertainty."

Another urban farm that has faced similar vulnerability is Grow Calgary, which originally produced its food on city-owned land from 2013 to 2018. When expansions to a major roadway were imminent, the farm was required to find a new location and start from scratch. It took a year to secure a new land partnership, and in spring 2020 the organization was able to operate once again (Klinke & Samar, 2021b). After four seasons of cultivating and rebuilding infrastructure on this privately owned land in Balzac, just outside municipal bounds, the organization had to relocate again in 2023, as the 73 acres were to be developed. Driving in any direction from Calgary, one can see a new neighborhood or warehouse being built where cropland or pasture once grew.

Highfield Regenerative Farm and Land of Dreams are two more operations situated on public land, holding municipal and provincial leases, respectively, that allow for the production of food above ground (the former is zoned as a brown site). Neither organization is allowed to alter the landscape in any major way (e.g., digging a well or swales for improved water access and security, planting or strategically removing trees) nor graze animals to break up the compacted soil caused by heavy machinery. Moreover, neither have reliable access to water or power, which makes the stretches in summer without rain precarious. The renewal of leases depends on the perceived outcomes of targets outlined in contract agreements, which holds both farms accountable to their intended projects, but leaves them vulnerable to changes in land use.

Nevertheless, with creativity, determination, and social organization, all three operations have been able to succeed in growing food *with* the land and in building stronger relationships with the City of Calgary. To Highfield's Operations Manager, Heather Ramshaw,

> the world of urban agriculture in Calgary is growing a lot, but there's not a lot of widespread municipal understanding. The department we work with gets it; we have a supportive municipal liaison who needs more support themselves to push these agendas forward. But generally, if you're trying to make policy and bylaw changes, that's when you hit walls here and there. Existing as a pilot project of the City puts us [Highfield] in a very unique position

where we can comment on certain things, such as best practices in agriculture. When a bylaw was being rewritten, we were consulted to ensure it would not negatively affect us, to make sure Highfield still fits in with the City's plans. We are continuing to report and we still have access to this property, which is amazing, but we aren't sure what other steps of support will be taken by the City. Calgary is years behind Canadian cities like Toronto and Vancouver in policy, execution, and support for urban agriculture. Although the change here seems slow, it's gaining momentum, and it's exciting to be a part of it! The network of urban farmers and people looking into food access has started to come together and collaborate, especially in the past year, as we work towards a similar vision.

At RRUF, the limitations we faced for growing on an apartment rooftop were more logistical. To get to the 16 planter boxes—which were filled by a lift with 1,800 ft^3 of soil—we had to squeeze tools, storage bins, and trays of transplants into one elevator and then climb up two flights of stairs. At the top, there was no setup for compost, tool storage, or shade, and the irrigation installed was inefficient. Despite these shortcomings, it was a great experience to grow food alongside the apartment tenants who had their own boxes. With proper architectural design that accounts for weight capacity and accessibility, we argue that integrating more rooftop gardens for growing food and native plants would add ecological and social value to urban centers.

Growing food in between buildings downtown (Figure 5) also had its perks and setbacks. The actual space and available parking was quite limited, which meant hauling supplies down several blocks. Since the plots were located on 17th Avenue, an area dotted with bars and restaurants, nothing could be stored at the site itself, as theft was an unfortunate reality. The water source was outside of the locked fence, so installing automated water-

Figure 5. Growing in Between Buildings Downtown (Left and Right)

ing wasn't feasible, which in turn required more frequent labor. Since quite a bit of shade was cast by the surrounding buildings, we were mindful to plant crops that did not require full sun exposure. The space was maximized with leafy greens, while the sunny rooftop garden overflowed with heat-loving plants. Nevertheless, it was a unique opportunity to grow produce for a restaurant right down the street. Passersby would stop and ask questions and sometimes spontaneously get involved. Due to the aforementioned challenges with this downtown site, RRUF decided to not renew its contract the following summer. We connected the property owner with Amber Cox, a Cree Métis artist and gardening enthusiast, who has since stewarded the space for community gatherings.

Finally, we recognize the spatial, temporal, and climatic limitations of our experiential learning research, as we are focusing on a single growing season in southern Alberta, Canada. Nonetheless, framed within the ethos of "ecological responsibility, social responsibility, and economic viability," we argue how similar regenerative SPIN farming operations can be scaled up and out to not only grow food but ecosystem resilience and community networks. The following summer, 2022, Root and Regenerate took on two more YA Apprentices, underwent a rebranding, updated its website and marketing, added 10 more shareholder spots to its CSA program, and acquired a passive solar greenhouse, which boosted the quantity of heat-loving crops. The farm team harvested a total of 6,127 lbs (2,779 kg), consisting of 2,290 lbs (1,038 kg) of roots, 2,909 lbs (1,320 kg) of greens, and 928 lbs (421 kg) of other assorted produce. Of that, 615 lbs (279 kg) were donated to local food access agencies. The farm welcomed two more YA Apprentices for the 2023 growing season and has continued to slowly scale up its customer base, production, and collaborations with other urban farms.

As farmland is blanketed by ever-expanding residential developments and shopping centers, and is increasingly controlled by concentrations of agribusiness, conversations around urban regenerative agriculture are more and more relevant. In the next section, we will situate our experiences farming in Calgary in the patchwork of Alberta's food landscape.

Situating Urban Farming in Local to Global Food Landscapes

In Canada, urbanization and the decline of farming populations has been visible across all provinces. While one in three Canadians lived on a farm in 1931, less than 2% of the total population now run farming operations. Canadian farm operators are primarily males over 50, with more female and young farmers on a steady rise. In Alberta, for instance, approximately 9% of farm operators are under 35, while 62% are aged 55 and over (Statistics Canada, 2021). While there are fewer farmers and farm operations in Canada, the average area per farm has grown with more area devoted to crop production and ranching. Over the past century, from 1921 to 2021, the total number of [reporting] farms decreased by 73% (711,090 to 189,874 farms), while the average farm area increased from 198 acres (0.80 km^2) to 809 acres (3.27 km^2; Statistics Canada, 2021). With an average provincial farm size of 1,000 acres (4.05 km^2), Alberta's agricultural landscape (Table 3) is reflective of the top two national farm production types: oilseed and grain farming and beef cattle farming, including feedlots.

These statistics and agricultural demographics are reflective of past, current, and future challenges for small-scale farmers in Canada at large, including cost of land and competition with investment companies producing oilseed, grain, and beef (Kepkiewicz & Dale, 2019; NFU, 2015). Lyle Weigum, co-operator of Winter's Turkeys Farm, and aspiring farmer Landon Grams spoke to these barriers to entry. Lyle shared:

> Both my parents were farmers and their parents were farmers. My father started a farm from scratch and has now reached the point of retirement; my sister has taken over. If she didn't, it would have been absorbed by either another bigger farm or a Hutterite colony. People that want to get into agriculture have to start on such a small scale. Then they see what it takes to be successful, which is usually large-scale. There are such high capital barriers to entry that it discourages or bars a lot of people from entry. It's not that there are fewer people that want to farm; there are a lot of people that

Table 3. Alberta's Agricultural Landscape

Agricultural Category	Crop or Animal Type
Livestock	Hens and chickens, hatching eggs, broilers and roasters, Cornish hens, turkeys, ducks, geese, cattle and calves, beef cows, dairy cows, pigs, sheep and lambs, horses and ponies, donkeys and mules, goats, llamas and alpacas, ostriches, bison, elk, deer, rabbits, minks, honeybees, and crickets
Field crop and hay	Oats, barley, wheat and durum wheat, rye, triticale, hemp, flaxseed, corn for grain and silage, canola, dry field pea, chickpea, fava bean, lentil, a small amount of dry white bean and canary seed, alfalfa, hay and other fodder crops, forage seed, potato, mustard seed, sunflower, and sugar beet
Vegetables (field)	Sweet corn, tomato, cucumber, green pea, cabbage, Brussel sprouts, carrot, beet, rutabaga and turnip, onion (dry, yellow, Spanish, and cooking), garlic, lettuce, kale, rhubarb, spinach, pumpkin, squash and zucchini, and asparagus
Fruits and berries	Saskatoon, apple, pear, plum and prune, sweet and sour cherry, apricot, strawberry, raspberry, cranberry, highbush blueberry, currant (black, red, and white), and haskap
Greenhouses	Fruits, vegetables, cut flowers, herbs, and potted indoor and outdoor plants
Other	Sod, nursery products, Christmas trees, and mushrooms

Data derived from the 2021 Census of Agriculture Mapping Tool
(https://www150.statcan.gc.ca/n1/pub/32-26-0003/322600032016001-eng.htm)

> want to do this work. But getting started is so difficult. It's so big. And so, there are fewer and fewer farmers. The people who are passionate and industrious about it, I hope they can find a way.

Landon observed:

> Farming in Alberta is vastly industrial, with feedlots and monocropped fields monopolized by large corporations. It is hard for small farmers to compete in today's market and make any money. Small farmers face many challenges, from setting up the necessary infrastructure to rebuilding soil in a field that has been damaged by years of conventional tillage, to acquiring crop insurance. When I apprenticed at a regenerative farm through the Young Agrarians, our crops not only suffered from low precipitation but a severe hailstorm that swept through. Fortunately, the farm has a loyal customer base and network of other producers who got them through it.

Another agrarian research participant spoke to the emphasis provincial and federal governments place on increasing Canada's export market:

> Technologies and infrastructure are not only funded for growing crops and animals, but for preparing them for export. The national goal is not to help achieve an infrastructurally and food-secure local or regional economy. Some money, attention, and policy is being directed to growing regional economies, but it's not where the majority of energy is being funneled. So, many farmers have felt pushed along this treadmill to get big or get out. While chasing profits, they need more land and special equipment, then pesticides, herbicides, special seed, etc. But where are the costs felt? What are the externalities that are made invisible for the average consumer?

Although there has been a heightened demand over the past 20 years for products grown and raised in Alberta, the landscapes are still dominated by a productivist conventional agri-food model (Beckie & Bacon, 2019). Additionally, what small-scale growers can actually do and who they can feed are further limited through municipal, provincial, and federal policies that are shaped by hegemonic development frameworks.

Approaches to Agrarian Development in Calgary

In most Canadian cities, the dominant approaches to agrarian and community development are reactionary and needs-based, focusing on increasing food access and security with limited ability to disrupt hierarchies of power (McEntee & Naumova, 2012). Food insecurity is often framed within poverty discourse—to which the solution is adequate income, a strong social safety net, and integration into the market (Levkoe, 2006). Food insecurity is "tackled" by secondary markets that function within a dependency model shaped by an uneven global capitalist economy (Claeys et al., 2021). Although food banks, hampers, and free meals are currently essential for meeting basic needs, "work done under the auspices of food security has often reproduced the socially inequitable conditions and relations it nominally seeks to address" (Cadieux & Slocum, 2015, p. 4). Moreover, the focus on productive intensification and agro-biotech solutions externalizes the socioeconomic, ecological, and political implications of global industrial agriculture (Claeys et al., 2021).

Our research is not claiming that the answer to solving global hunger is regenerative urban agriculture. We acknowledge the limitations of production in terms of scalability (i.e., the acreage of urban yards relative to Sections and Quarters), vulnerability (e.g., someone else owning and controlling the land), human capacity (e.g., number of trained farmers and the labor input due to limited machinery), and environmental impact (i.e., burning fossil fuels to get a relatively smaller amount of produce from point A to B). Nevertheless, urban farming can be a tool to highlight the mismanagement of how internationally traded food is grown and circulated, as it is controlled by an increasingly corporatized agro-food sector (Akram-Lodhi, 2013; Holt Giménez & Shattuck, 2011). Urban farming can be a pathway of collaboration between local food movements and emergency food systems (McEntee & Naumova, 2012) and can be integrated into federally funded school farming programs or into a business model wherein a corporation could employ urban farmers to grow food for its employees. With over 5,600 parks and natural areas spanning 10,000 hectares (100 km^2), there are ample opportunities for regenerative farming to be incorporated into the City of Calgary's parks operations. For instance, a targeted grazing program was initiated in 2016 for goat and sheep herds to support land management and naturalization projects across the city's bluffs. What's more, as demand for renewable energy grows at national and international levels, urban farmers could support the transition to electric vehicles due to their close proximity to charging stations between sites of production and distribution.

Many urban farmers utilize indoor spaces such as containers and warehouses to grow microgreens (e.g., Micro YYC, Little Sprout House, Micro Acres, Sunleaf Microgreens YYC, and Holistic Urban Farmer), herbs and leafy greens (e.g., The Basil Ranch, Deepwater Farms, Greengate Garden Centres LTD., and Lil Green Urban Farm), and mushrooms (e.g., Pennybun's Mushrooms) year-round. In yards and urban farms, one can find apiaries stewarded by MOB Honey, Buzzy Bee Honey, Forever Bee, and The Urban Bee Hive, who receive support and guidance from the nonprofit Calgary and District Beekeepers Association. Offering workshops and resources for urban growers, the Calgary Horticultural Society and Urban Farm School strengthen partnerships and build cultivation skills among community members. If community members are interested in learning about permaculture or acquiring a permaculture design certificate, they can reach out to the Permaculture Calgary Guide, Verge Permaculture, or Prairie Sage Permaculture. Other permaculture-oriented organizations include Permeate, reGenerate Design, Urban Farm Permaculture Project, and the Métis-led social enterprise FoodScape Cooperative. Sponsored by the Permaculture Calgary Guild, Calgary Harvest is a nonprofit organization that connects homeowners with registered fruit trees to Calgarians interested in picking their apples, crabapples, plums, pears, and sour cherries.

In addition to RRUF, Chef's Table is another SPIN farming operation that grows produce for local farmers markets, restaurants, CSA programs, and YYCGD. Connecting Calgarians (and area) to 24 farmers in Southern Alberta, this farmer-owned cooperative offers an online Farm Store, Vegetable Harvest Box (CAD $35.00/box, weekly or biweekly), and add-on subscriptions. Customers

can access GMO and glyphosate-free produce, microgreens, grass-fed meats, fresh eggs, BC fruit, and locally roasted coffee. With 20 pickup locations across Calgary, Cochrane, Airdrie, Okotoks, and Langdon, YYCGD emphasizes the importance of "healthy ecosystems, regenerative practices, and seasonal goodness" to increase the region's food resilience[5] (see Tendall et al., 2015; Walker & Salt, 2006, for more on food resilience). The growth of Calgary's agricultural scene has been supported over the years by the City of Calgary's 2012 Food Action Plan,[6] COVID-19 Food Resilience Team, and Food Access Collaborative. The introduction of affordable mobile markets (i.e. Fresh Routes) and advocates of food justice (Alkon & Norgaard, 2009; Calhoun, 2008; Reynolds et al., 2018) have also supported Calgary agriculture.

While situating our ethnographic, experiential learning research in Calgary's approaches to agrarian and community development, it is important not to fall into the "local trap" (Carolan, 2016; Hinrichs, 2014). The importance of "local control to democratic decision-making" (Beingessner, 2013) is invaluable in supporting communities to rebuild socially just, economically viable, and ecologically sustainable food systems (Blay-Palmer et al., 2013). However, as DuPuis et al. (2006) make clear, the "local" is often a site of inequality. By practicing a "reflexive politics of localism" (DuPuis & Goodman, 2005), regenerative urban farmers can apply a "progressive sense of place" in which the scope of inequalities wrought by globalization and neoliberalism can be articulated in order to work toward a rights-based food system (Hassanein, 2003; Levkoe, 2006). In these ongoing processes and relationships, it is essential to connect with global resistance movements, such as Conscious Planet's Save the Soil Movement,[7] to support those facing similar barriers imposed by the system. Moreover, it is crucial to build alliances for collective action that span spatial and political bounds.

Local to Global: Sowing Seeds for Alliance-Building

Around the world, grassroots organizations have been resisting the concentration of land-grabbing, input-heavy production, environmental degradation, volatile markets, and the cooptation of water and seeds through protests, farmer-to-farmer workshops, and social movements. One notable international movement is La Vía Campesina (LVC). Founded in 1993, LVC emerged as a counterforce to neoliberalism. Through 182 organizations and more than 70 popular education training programs, LVC connects over 200 million farmers on small and medium-sized farms, landless workers, Indigenous people, fishers, pastoralists, migrant farmworkers, rural women, and youth from 81 countries. Grounded in a Food Sovereignty approach, this "global voice of the peasants" works toward equitable access to and control over resources and social rights, equal participation and representation in food politics, and the eradication of violence against women (La Vía Campesina, 1996; Nyéléni, 2007; Wittman et al., 2010). In Canada, two member organizations of LVC include Union Paysanne, an agricultural and civic organization operating in Quebec, and the National Farmers Union, a country-wide union of Canadian farmers seeking to achieve policy and reform (Dale, 2021). Within the National Farmers Union, YA advocates on behalf of new agro-ecological farmers, such as ourselves.

Supporting global and place-based efforts for social, ecological, and food justice from Canada have also been alternative food initiatives, Idle No More campaigns, provincial networking organizations, and food policy councils. The People's Food Commission, for example, brought together thousands of actors in Canada into conversations around the food system. The conversations set the stage for the National Food Security Assembly, Food Secure Canada, Canadian Association for Food Studies, People's Food Policy Project, UN

[5] Watch the New Urban Farm Partnership video (2016) *Cultivating Calgary's Local Food Resiliency*, available at: https://vimeo.com/160987626; *GROUNDED* (2020): https://www.storyhive.com/projects/6128#project_pitch; and the *Emerald* documentary series, season 3: https://www.youtube.com/watch?v=wdSDo5tlmj0&feature=youtu.be
[6] https://www.calgary.ca/major-projects/food-action-plan.html
[7] https://consciousplanet.org/

Special Rapporteur on the Right to Food visit, and Regeneration Canada, among others (Agriculture and Agri-Food Canada, 2019; Levkoe, 2006). Another organization connecting rural farmers and ranchers across Alberta, specifically, to share climate strategies is Rural Routes to Climate Solutions. In addition to a regenerative agriculture lab, solar lab, podcast series, and blog, Rural Routes has partnered with the Siksikaitsitapi Agriculture Project, which is "an avenue for the Blackfoot Confederacy of Southern Alberta to highlight on-farm and on-ranch climate solutions (e.g. regenerative agriculture, farm energy efficiency, on-farm clean energy) on Blackfoot territory."[8] Dawn Morrison (2011) of the Secwépemc Nation and director of the Working Group on Indigenous Food Sovereignty[9] urges Canadians, rather than subsuming Indigenous food activism, to engage with Indigenous cosmos, struggles, and narratives and utilize our respective platforms—such as this publication—to promote Indigenous-led organizations responding to community needs around food.[10]

To share our experiences, experiential methods, and findings with the public and fellow scholars, we co-presented at the 2022 University of Calgary Graduate Students' Association Symposium and in the Department of Anthropology and Archaeology Talk Series. We also co-hosted farm tours with the YA Apprenticeship program and the Calgary Institute for the Humanities' Food Studies Interdisciplinary Research Group. Through our academic-agrarian partnership, we hope to continue building alliances both locally and globally.

Conclusion

One of the biggest challenges facing our global food and farming system is the feasibility of simultaneously supporting economically viable farmers, sustainable or regenerative environments, and sufficient food for all humans. At the production level, almost all urban and rural farmers in Southern Alberta participate in the market economy. As relative living costs are reinforced by the economic model—which regulates prices in housing, transit, gas, and other expenses—farmers must market to those who can afford plants and animals grown by well cared-for workers and soil. This predominantly includes middle- and upper-class households with sufficient financial capital to participate in an alternative food network (AFN). In our season of experiential learning research, our CSA shareholders, YYCGD Harvest Box clientele, and farmers market attendees were able to purchase the CAD $7 free-range eggs, CAD $5 carrot bunches, and CAD $4.50 microgreens we offered, but this is not the case for the majority of Calgarians.

Beyond cost, the spaces in which AFNs operate—including farmers markets, CSA programs, and community gardens—have been critically examined for their "whiteness" and assertion of privilege (Allen, 2008; Mares & Peña, 2012; Slocum, 2006). As demonstrated by Kato (2013) and Hanson et al. (2019), other factors hindering participation in an AFN or CSA include limited choice in fruits and vegetables, unfamiliarity of the model, high upfront cost and purchase options, and time-intensive provisioning. The accessibility and hours of pick-up locations have also been criticized, as they are most often located in areas where profit can be made from sales, and not in regions with lower economic incomes.

In Calgary, distributors have partnered with the City to provide more accessible pick-up and pop-up locations at C-Train Stations and Community Association centers, as well as offering door-to-door delivery services for an additional fee. RRUF also observes the aforementioned barriers in its operations and strives to address them the best they can while functioning in the existing economic model. The farm diversifies produce options wherever possible and offers CSA customers the option to swap produce at pick-ups. This diversity can be

[8] https://rr2cs.ca/siksikaitsitapi-program/

[9] To learn more about Indigenous Food Sovereignty in the Canadian Context, see: https://www.indigenousfoodsystems.org/sites/default/files/policy_reform/pfpp-resetting-2011-lowres_1.pdf; and https://foodsecurecanada.org/sites/foodsecurecanada.org/files/indigenous-food-sovereignty-eng.pdf

[10] See https://www.indigenousfoodsystems.org/ ; https://www.itk.ca/projects/inuit-nunangat-food-security-strategy/; https://www.anishinaabeagriculture.org/food-sovereignty; and https://www.syilx.org/, among many others.

limited by what can be feasibly grown to produce a profit or at least break even. Split payments are also made available, as opposed to the full cost up-front, and relative to similar CSA programs, RRUF offers a lower share cost. Finally, shareholders can choose between two different pick-up locations and timeframes, although these remain a persistent barrier. The logistics and costs associated with increasing options are currently not feasible.

The handful of farmer-led initiatives that do work directly with food-insecure populations to build capacity in farming, or grow with the intention of streaming yields into food access agencies, still function within a cycle of dependency upon donors and volunteers. This has been critiqued as an unsustainable and privileged organizational structure, particularly for women who may already carry a double burden of household and (re)productive labor (Som Castellano, 2016). When a single mother of four is already overburdened with responsibilities, how could she be expected to farm and provide food for her family? Even with increased opportunities for relationship-building and knowledge-sharing between growers and consumers in an AFN, farmers and farmer cooperatives are challenged with engaging local residents—and therefore scaling up production (Kato, 2013). Co-owner of YYCGD Rod Olson expressed how they are now down to 300 CSA Harvest Boxes a week; 500 is their sustainable target:

> During the pandemic, we saw an uptake in shareholders. People could not travel, and so they put their interests and dollars in the local economy. But now, post-COVID, people are wiped out; they just need to do the most convenient thing. Regenerating our food system is not convenient. We are fighting against the convenient mecca of the industrial food system.

Urban agriculture will not end world hunger, solve climate change, or increase global soil fertility alone. To Kolby Peterson, the YA Alberta apprenticeship coordinator,

> regenerative farming is needed en masse; the scale needs to be in broad strokes across the landscape. But in thinking about how human beings, myself and the people on this farm, how we meet our needs, regenerative agriculture needs to be broadened to include all of living. What does a regenerative life look like?

As urban populations and development expansion continue to rise, as do barriers to accessing rural land, there need to be frameworks and policies in place that support agrarian and soil-building initiatives in urban spaces.

Recommendations for Future Research

As urban agriculture becomes more prolific, our recommendations for further research include the incorporation of land-based learning in urban farming processes among post-secondary courses (Klinke & Samar, 2021a) and the contradictions and convergences of Indigenous Food and Land Sovereignty efforts with urban farming expansion (Grey & Patel, 2014; Kepkiewicz & Dale, 2019). We also recommend researching the possibilities for land-sharing and cooperative farming models (Sumner, McMurtry, & Renglich, 2014) and community-led organization strategies to grow and circulate food outside of the market economy (Claeys et al., 2021; Dale, 2021). If a SPIN farming model were to be replicated in thousands of urban plots all over the world, it would be extremely valuable to gather quantitative data on its cumulative impact, as well as qualitative data on customers' feelings toward accessing local food and perceptions of health benefits across different ethnicities, classes, sexes, and so forth. Further comparative research could examine the yields of a SPIN operation compared to those of an average rural vegetable farm of similar acreage. The comparison could show the cost of a vegetable bed in terms of water, plants, irrigation, time in hours, yields, and returns. This comparative analysis could be expanded to include the number of families served per bed and an estimate of nutrients per bed of a popular crop.

Impact of our Work

In and around Calgary, the number of organic, regenerative, and agroecological producers has visibly increased alongside beekeepers, permacultur-

ists, indoor growers, coffee roasters, brewers, and more. This growth in alternative food and farming is greatly needed in a time of corporatized industrial agriculture (Emile, 2016). At the same time, the city has seen a rise in demand for social agencies, registered charities, and community groups working in food banking, hamper, rescue, and redistribution programs. In the past few years, there have been more interactions among food producers, distributors, and social agencies, but most of the work continues to take a siloed approach. Most often, researchers conduct theoretical studies from within the university, while farmers spend long hours tending their crops and animals. Agencies race to meet a growing demand for basic necessities, and policymakers adapt to ever-changing governing agendas. If research networks are to truly help regenerative agriculture "better deliver on its promise of providing enhanced social and environmental benefits"—the theme of this Special Issue—then we need to look beyond our agrarian collaborations to see how academic seeds of praxis are being tended in the dynamic social soil that supports our work.

In this reflective essay, we depicted the collaborative approach taken between a graduate student researcher and an urban farmer, coordinated and supported through a regional agricultural organization, the Young Agrarians. We contextualized our five-month fieldwork in the broader characteristics of Albertan agriculture and the dominant approaches to agrarian development in Calgary. Connecting local experiences to global movements, our paper emphasized the importance of growing the grassroots up and out, while staying grounded *with* the land, to address the structural inequalities that affect small-scale farmers in both rural and urban settings. Our hope is that practitioners and researchers working in food systems and coalition-building will be able to draw upon the frameworks and ideologies put forth while tailoring them to the people and networks of their area.

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Fostering Socially and Ecologically Resilient Food and Farm Systems Through Research Networks

SPECIAL SECTION SPONSORED BY:

The evolution of a partnership-based breeding program for organic corn

Walter A. Goldstein *
Mandaamin Institute

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Abstract

This paper describes decades of research developing a new type of corn (maize) cultivar that utilizes partnerships with seed-borne, bacterial endophytes to create environmentally friendly, nutritious corn that is better adapted to organic farming. Over time the project engaged and formed multiple, evolving networks of corn breeders and other scientists, organic farmers, nongovernmental organizations (NGOs), private companies, the U.S. Department of Agriculture Agricultural Research Service (USDA-ARS), and state agricultural universities in several states. It addressed and partly resolved the need for developing (a) yield-competitive hybrids with greater nutrient density (methionine and minerals), (b) better adapted inbreds for organic production conditions, and (c) reduced pollution from nitrogen fertilizers.

The partnership approach taken also differs from usual top-down mechanistic breeding approaches in that the methods of breeding entailed holistic attention, learning, and respect for what turned out to be corn plants evolving in symbiogenesis with beneficial microbial partners. Initial studies indicate that the resulting corn from the program is competitive in yield but has better

* Walter A. Goldstein, PhD, Executive Director, Mandaamin Institute; W2331 Kniep Road; Elkhorn, Wisconsin 53121 USA; +1-262-348-7534; wgoldstein@mandaamin.org

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nutritional value. It obtains more of its nitrogen from microbial biomass and organic matter and nitrogen fixation than does conventional corn. Its performance partially depends on seed-borne plant/microbial partnerships. This corn continues to be developed at the Mandaamin Institute but is also being commercially introduced for testing by farmers.

Keywords
corn, maize, methionine, symbiogenesis, organic corn breeding, rhizophagy, nutrient density, nitrogen fixation, collaborative research

Introduction

Corn is the most produced cereal in the world. In the U.S., the Corn Belt Dent corn was developed from native southern dent and northern flint varieties. Its productivity was enhanced by the breeding and use of hybrids. Because of its inherent productivity, corn has come to assume a predominant role in US agriculture and in the production of feed and fuel. Crop rotations in the Eastern third of the country are rich in corn and this has been possible due to the use of synthetic fertilizers and pesticides. Corn is also the most widely grown organic row crop in the U.S. (USDA National Agricultural Statistics Service [USDA NASS], 2022), as well as a key ingredient for supporting organic animal production. The domestic organic corn supply is generally inadequate (Alonzo, 2016; Kowalski, 2017; McBride & Greene, 2015), with the deficit in supply met by imports of grain, sometimes with fraudulent consequences (Ross, 2018).

The corn breeds used today by breeding companies are largely derived from corn bred by public-sector breeders from state universities and from USDA ARS in the last century. These scientists were responsible for many of the innovations in plant breeding that have led to diverse and productive hybrids. The consolidation of seed companies by a few seed industry multinationals has led to greater investments becoming available for research and development. Considering industry's investment, and believing in the potential of genomic approaches, the USDA and universities phased out positions and funding sources for field-based public corn breeding while focusing funding on molecular analysis and technologies. Public and private breeders retired and took with them the culture of practical field-based corn breeding. Corn breeding became owned by industry and increasingly genomics and laboratory driven. As consolidation limits competition and farmer choice (Davies, 2022), there have been negative effects on farmers and society (Hacket, 2021). Since the turn of the millennium, the cost of corn seed has been increasing, and pollution from pollen drift intensified as the percentage of GM corn grown increased to over 90% (Center for Food Safety, 2023).

Today, the corn hybrids used by most organic farmers are bred by large private companies to perform under conventional conditions, in high-density planting with high levels of synthetic nitrogen (N) fertilizers and pesticide applications (Mastrodomenico et al., 2018). However, this status quo is not a sustainable one for the planet. Dependence on N fertilizers means continued pollution of ground and surface waters with nitrate and continued high emissions of nitrous oxide, a potent greenhouse gas. Furthermore, although conventional hybrids are high yielding and readily available, they provide only a partially good fit for the needs of organic agriculture. Gains in grain yields are due to the industry investing in intensive breeding and testing programs that develop plants that produce high yields wherever they are planted, including under stressful conditions. However, the parental inbreds developed in such programs when grown for hybrid production under organic conditions often lack vigor, tending to be nutrient deficient and to compete poorly against weeds (Goldstein et al, 2012). Furthermore, organic inbred, hybrid, and grain production all have problems with genetically engineered (GM) contamination, soil nutrient limitations on organic farms (especially N), climatic instability, and weeds. The hybrids available to organic farmers depend on nitrate and ammonium producing fertilizers. Organic farmers often use chicken manure as a fertilizer to address N needs of corn, but it is expensive, potentially polluting, and often derived from non-organic confinement operations.

Furthermore, modern corn hybrids have

increased yield potential but inadvertently have led to inadequate nutritional value; grain protein content decreased from 10.3% in 1940 to a projected 7.4% in 2010 (Duvick et al., 2010). Organic poultry farmers need to have corn varieties with a high content of the essential amino acid methionine in their protein, to enable the production of animals without depending on feeding them synthetic methionine.

New cultivars targeted to thrive under organic conditions are needed. This paper describes the evolution of a partnership breeding approach with corn that has been directed toward making up some of the deficiencies associated with conventional corn. Begun in 1988/1989, the program has survived and evolved only by participating in multiple networks of different kinds. Admittedly, the crucial central partnership is a newly evoked breeding relationship with the emergent, creative biology of corn and its symbiotic endophytic microbes. But other key partnerships involve other organic corn breeders, farmers, scientists, NGOs, seed companies, universities, the USDA, and various private and public funders. The partnership has depended on informal networks that have been active on different scales and at different times for different ends. Those networks have shifted in accordance with the maturity and needs of the program and the interests of farmers and others, as will be described.

The paper falls naturally into four parts. The early phase describes the inception of the program and how it evolved into cooperative breeding and testing networks, as well as opportunities that emerged with the Seeds and Breeds Movement. The second part describes initial efforts to improve nutritional quality and nitrogen efficiency, two traits desired by organic farmers, while maintaining adequate grain yields. The third part describes the results from multiple research partnerships that deepened our capacities to improve corn as well as our understanding of how to work with corn to improve its quality and environmental friendliness. Finally, we reflect on the potential value for society of what has been achieved, on barriers to further corn development, and the need for even broader partnerships to enable the full potential of organic corn.

Part 1. The Program's Inception, Including its Early Efforts, Philosophy, Partners, and Funding

I began my employment as research director at Michael Fields Agricultural Institute (MFAI) in the fall of 1986 after finishing my doctorate in agronomy at Washington State University. My entry into corn breeding started with a field day on Dave Christenson's organic farm in Jefferson County, Wisconsin, in 1988, where I was surrounded by a group of seven organic-friendly farmers who requested that I begin to breed open-pollinated corn for them. Their experience was that open-pollinated corn had better nutritional value—more minerals and protein, and better taste. The better quality was confirmed by their experiences with animal preference by horses and cattle. However, the open-pollinated corn they had grown did not stand well in the field at modern planting densities; they suggested that I could remedy that.

Subsequently, I visited the late Albert A. Arens (1904–1988) at Green Acres Seed Company in Hartington, Nebraska. Arens bred and sold corn. He was renowned in certain organic farming circles for selecting plants that performed well without any fertilizers, and he also had a specific program devoted to breeding corn that produced multiple ears on each stalk. This resonated for organic farmers, as they also produced corn without synthetic fertilizers and some of them tended to produce corn under conditions in which the multi-ear trait would be useful. At the time of the visit with Arens in 1988, he was terminally ill with cancer and was concluding his last year growing corn. He showed me his breeding families and discussed corn breeding. At the end of the visit, he announced, "You are pregnant with an idea; you are going to become a corn breeder!"

I was challenged by these experiences and recognized the valid need for corn with better nutritional value. Despite there being no obvious long-term funding sources, I decided to try to grow different kinds of corn and develop open-pollinated corn with improved nutritional value and better standing ability. In 1989 I contacted several experienced corn breeders: Dr. Arnel Hallauer of Iowa State University, H. Z. Cross of North Dakota State University, and James Coors of the University

of Wisconsin-Madison, and obtained seed stocks from them. I also received seed posthumously from Arens' prolific work from his nephew, and from Mark Millard at the USDA ARS Plant Introduction system (Mark Millard). Other significant contributors included a gift of corn seed from several Hopi farmers. Altogether, those stocks included both native corn varieties and Corn Belt dent (field corn with substantial soft starch content) varieties and populations.

From the beginning of the project, an attitude that emphasized partnership has played an important role in its success (Goldstein et al., 2019). I have not pursued the sort of mechanistic, reductive, top-down approach to produce uniform products as quickly as possible, which is common in the breeding world. Rather, I regard the maize plant as a biologically creative partner in dialogue with the breeder as in a kind of slow, multiyear dance. In this conceptualization, the proper human role is to establish useful conditions for evolution and selection, pay diligent attention to the evolving bodies of the plants as they grow in the field, make insightful observations, collect relevant data, and make selections that favor both plants and humans as the corn plants continue to evolve. The human role involves thinking, progressive learning, and gradually developing informed and accurate perception and judgment. This approach involves evolution of both the plant and the breeder. It brings into the breeding process the perspective of an I-Thou kind of relationship to supplement the usual I-It relationship, the latter defining plants simply as objects to be used (Buber, 2023). The I-Thou attitude is comparable to that of the Native people who were the original stewards of corn (Kimmerer, 2013).

Starting in 1989, for 14 years I carried out a small part-time selection and breeding program in the MFAI test plot fields and on my own farm, to provide seed for farmers who wanted to keep their own seed. I made crosses and developed new open-pollinated corn with improved yields, enhanced quality, and good standing ability. The program served an informal network of approximately 20 farmers who wanted to keep their own seed stocks. Participants mainly came from Michigan, Wisconsin, Iowa, Indiana, Missouri, and Ohio, with a few from several other states. The farmers obtained seed by just paying for the shipping charge, under the agreement that they would give the program feedback on their results.

The effort often entailed educating farmers how to grow, select, harvest, and maintain the corn populations. Instruction occurred mostly on a one-to-one basis over the telephone or at field days in Wisconsin organized by MFAI and in Iowa organized by Practical Farmers of Iowa (PFI) to include on-farm selection. Of the farmers, Don Adams from Madrid, Iowa, and Dan Specht from MacGregor, Iowa, took the most active interest in breeding, selecting, and feeding the corn. One of the most significant populations that came out of working with them was Nokomis Gold. Nokomis was developed from a mixture of Southwest native corns from the Hopi, Zuni, and Navajo tribes and included some of Arens' corn; it played an important role in further development of the corn breeding program. Dan Specht continued his own breeding work, and by the time of his untimely death in 2013 he had selected a polenta population from Nokomis Gold and other seed stocks provided by the project.

Partnership with USDA ARS

Around 2000, I was involved in joint research with Kendall Lamkey of the USDA ARS in Ames, Iowa, and Zeno Wicks III of South Dakota State University. We were testing different open-pollinated varieties with a grant from the USDA Sustainable Agriculture Research and Education (SARE) program. I was also taking part in educational events at PFI dealing with corn quality and relationships between corn, soil, and nitrogen. In 2001, at a field day on the Adams farm sponsored jointly with PFI and USDA ARS, seed of Nokomis Gold was made available to farmers in larger quantities. A winter field day was also held at a Northeastern Iowa State University research station. Dr. Lamkey showed results from the University breeding program, and I showed results from the Michael Fields Agricultural Institute trials based mainly in Wisconsin. Cornbread was baked using flour from several different corn varieties and hybrids and offered in a blind taste test. The variety Nokomis Gold was the preferred source of corn. However, the yield of

corn from the Michael Fields corn program still lagged considerably behind that of hybrid corn.

In 1999 I was advised by the MFAI administration to stop breeding the open-pollinated corn because there was no sustaining source of funding for it. In response. I requested assistance from Senator Herb Kohl of Wisconsin and from Senator Tom Harkin of Iowa. Senator Harkin was approached with assistance from Robert Karp, then executive director of PFI. With the help of the senators, it proved possible to obtain an appropriation in 2003 that allowed MFAI to continue research on corn together with USDA ARS and PFI at Ames, Iowa.

Cooperative Breeding and Testing with Organic Farmers

The time around 2000 was tumultuous for many organic corn farmers because there were problems with contamination from the pollen of genetically engineered hybrids onto organic corn, which could negatively affect the sales of organic grain and organic seed. As it seemed very important to ask farmers which direction the corn breeding research should take, in 2003 the I organized an open session at the Upper Midwest Organic Farming Conference (now known as the Marbleseed Organic Farming Conference), one at the Minnesota Organic Farmers Conference, and one at the annual PFI conference. The objective was to discuss what kind of corn these organic farmers wanted, not just what they did not want. The sessions were well attended, with about 40 to 70 farmers at each event.

The results were consistent across meetings. While the farmers clearly did not want genetically engineered corn contamination, in addition they wanted corn that did well under their systems, which often had less available nutrients, especially nitrogen. They wanted corn that competed well with weeds. They also wanted nutritional quality, especially those farmers who fed their own livestock. Only a few farmers wanted open-pollinated varieties from which they could keep their own seed. Most of them wanted hybrids, because the open-pollinated varieties did not yield enough. The overall principle for them was that the corn they used should have better quality, but it should also produce at least 90% of the yields attained by conventional hybrids.

The experience of the MFAI breeding and testing program to that point had been that competitive yield levels could only be obtained by utilizing hybrid vigor. I then decided to focus most of my effort on breeding for hybrid production, while continuing some, but less, work on open-pollinated populations. Soon afterwards, in 2003, Linda Pollack from USDA ARS took over the USDA breeding program from Dr. Lamkey as he moved into the ISU breeder position. Dr. Pollak had helped found and direct the USDA Latin American Maize Project and the Germplasm Enhancement of Maize Project, which were both concerned with utilizing the potential of exotic corn landraces (Pollak, 2003), so she possessed experience breeding populations into commercial grade inbreds. I obtained additional counseling on the procedures needed for breeding inbreds and producing hybrids from Dr. Kevin Montgomery, who had decades of experience developing hybrids at three large commercial companies and subsequently advised the MFAI project.

The USDA ARS–Pollak program worked on both breeding for organic farming and improving grain inherent quality. In conjunction with the program, the MFAI staff attempted a holistic, cooperative, farmer-engaged, variety-development and seed-production model. An immediate question was what kind of hybrids should be bred. Producing hybrid corn by crossing inbreds is difficult for farmers to do for themselves because the inbreds are short, lack vigor, and demand special care. However, making hybrids by crossing vigorous populations was feasible for farmers and offered them the financially attractive possibility of easily producing their own hybrid seed. The USDA and ISU programs had experience with producing varietal hybrids that produced competitive yields under organic conditions, even if such hybrids lacked superior nutritional value. Therefore, the MFAI and USDA programs jointly engaged in breeding new, vigorous, genetically narrow populations and testing them in combination with other vigorous, narrow populations (varietal hybrids) or with inbreds (top crosses).

An example of the cooperation was the devel-

opment of a significant breeding family. The Nokomis Gold variety developed by the MFAI program was grown for many years on the Adams farm and was selected by Adams and me using stratified mass selection. John Golden, a technician from the Ames, Iowa, USDA ARS breeding program, also made selections from it that showed good combining ability in hybrid trials. These selections were subsequently further bred in Wisconsin to produce LMPNG28 breeding lines, which showed good per se productivity and combining ability in hybrids. Inbreds from the NG10 branch of that family are still in use in Mandaamin Institute's breeding, testing, and commercialization program.

Testing and farmer field days took place on several organic farms in Wisconsin: Mark and Randy Hoffman's farm in Whitewater, WI, Nokomis Farm in East Troy, WI, the Zinniker farm in Elkhorn, WI, Skip Kaufman and Jessie Niggerman's farm near Eau Claire, WI, and the MFAI farm in Troy Center, WI. In Iowa, test plots from both programs were grown on three to five organic or low-input sites each year. Outreach, field day, annual event, and organizational support was provided by PFI. A detailed account of the farmers involved in the MFAI portion of this partnership, the fields and practices used, selection and breeding methods, breeding philosophy, and the targeted trials and outcomes for yields, agronomic traits, and quality is available (Goldstein et al., 2019). The pedigree breeding program, which is mainly used to produce inbreds, entails sequential inbreeding and selection for plant performance and grain quality on N-limited farm sites, coupled with early testing of hybrid combinations on multiple sites.

Although several varietal or top-cross hybrid combinations seemed to have promising yield performance, there were two problems. First, they had somewhat higher grain moisture contents at harvest. Second, organic seed companies expressed disinterest in them because they were not as uniform as single cross hybrids made by crossing clone-like inbreds. Due to the second issue, over time both programs moved in the direction of single cross hybrids with good combining ability. It became increasingly clear, however, that it might be important to select the inbreds for performance under organic conditions. A substantiating observation made by both breeding programs was that many inbreds raised conventionally did poorly when grown under organic conditions. They appeared to lack vigor and were nitrogen deficient. However, when grown repeatedly under organic conditions, some appeared to adapt and improve both vigor and nitrogen uptake, a phenomenon I later studied and confirmed (Goldstein et al., 2019). It was attributed to genetic and epigenetic shifts and to shifts in the populations or the activity of endophytic microbes.

The Seeds and Breeds Movement

Parallel to these developments was the emergence of a movement fostering awareness of the impact of seed industry consolidation, restrictive patents on seed available to farmers, and the general decline in publicly sponsored breeding and seed diversity. Michael Sligh from the Rural Advancement Foundation International-USA, working with an organizing committee composed of concerned public breeders, including Professors Kendall Lamkey (ISU), Bill Tracy (University of Wisconsin), Charlie Brummer (University of Georgia), and myself, organized several conferences on these themes in Washington, DC, and at Iowa State University. Efforts were made to interact with USDA competitive grant authorities to open the door to funding public breeding activities. Initially, it appeared to be an uphill battle to create an avenue beyond genomic research that would enhance seed availability and public breeding. Eventually, the work of the political arm of the sustainable agriculture movement led to important changes, most significantly an emphasis on breeding in the new USDA competitive grant organic agriculture funding program. This made it possible to maintain my corn program and many other worthwhile public breeding efforts.

Part 2. Improving Quality, N Efficiency, and Microbial Partnerships

The Search for Better Grain Nutritional Quality

In order to diversify and find better sources for breeding, MFAI also began a partnership with the

USDA Germplasm Enhancement of Maize (GEM) project. The GEM project aimed at developing useful diversity by crossing with exotic corns possessing attributes not present in Corn Belt corn. The GEM team initially was primarily concerned with improving protein quality. In addition, Paul Scott of the USDA ARS unit in Ames was also actively breeding for improvement of protein quality.

The need for improving the quality of corn was explored at MFAI in different ways. A great deal of research by the international community of corn scientists had been devoted to improving protein quality, with special focus on the lysine content in grain. The international corn breeding center in Mexico, CIMMYT, had devoted much effort to using the opaque-2 gene for that purpose. Early experiments we did in Wisconsin testing opaque-2 in crosses confirmed that it was not well suited for commercial production because of its effects on yields, the fragility of kernels, and that it was a recessive factor that could easily be deactivated by contaminating pollination. The more pressing concern of the organic community was the amino acid methionine, which is a component of protein (Fanatico & Ellis, 2016). Methionine is the most seriously deficient amino acid in poultry feed. Because the organic poultry industry is restricted in its use of synthetic methionine, the organic community has needed to find methionine in other feedstuffs, as the USDA may phase out the use of synthetic methionine (McEvoy, 2015). Corn with a high methionine content could substantially help organic poultry farmers. Therefore, the project focused initial efforts on testing the *floury-2* gene because it increased the methionine content of grain considerably.

We pursued three lines of research (Goldstein et al., 2008). One was the introgression of the *floury-2* gene into several open-pollinated populations with good combining ability. The second was testing a set of high methionine breeding lines identified through cooperative work with the GEM program. The third was developing a rapid nondestructive test for methionine in corn so that we could breed for the trait.

The task of developing high methionine corn entailed discussions and cooperation with the Methionine Task Force, a consortium of up to 15 large organic poultry companies. We worked with Dr. Charles Hurburgh and his colleagues at the Iowa State University Grain Quality Lab to develop a near infrared spectroscopic calibration that would allow us to rapidly detect methionine, lysine, and cysteine (Goldstein et al., 2019; Hardy et al., 2009; Jaradat & Goldstein, 2013). The calibration broke the inherent correlative relationship between protein and amino acids (proteins are composed of amino acids) which had previously prevented effective calibrations. This was only possible because we used a calibration set of samples that possessed protein with different percentages of methionine, lysine, and cysteine in their protein, so results did not depend exclusively on the level of protein in the grain.

Corn varieties selected simply for high levels of protein generally increased α-zein storage proteins, which have lower concentrations of the essential amino acids (Darrigues et al., 2006; Frey, 1951; Tsai et al., 1992; Wu & Messing, 2012). Feeding such protein to poultry can be expected to lower feed efficiency and increase ammonia emissions in poultry litter (Burley et al., 2016). The high methionine varieties received from the GEM program were high protein, hard-kernelled corns (Goldstein et al., 2008). Higher levels of methionine content in the grain were due to a high protein content; so the overall quantity of methionine in the grain depended on achieving a high protein content in the grain. Trials with farmers showed that to sustain the methionine content from farm to farm with these varieties because the protein content of the grain varied from site to site. In addition, we were informed by industry and by Dr. Mark Cook at the Poultry Science Department of the University of Wisconsin-Madison that high protein content in corn was not desirable due to problems with ammonia emissions from manure. What was needed was a high percentage of methionine in protein and a moderate level of protein.

The soft-kernelled, *floury-2* corn had a considerably higher percentage of methionine in its protein. It could produce high percentages of methionine in protein when the protein content of the grain was low. This provided greater stability in methionine amounts across farms. Feeding trials

took place with our *floury-2* corn hybrids. The first set of trials with broilers was done by Organic Valley Coop (Levendoski & Goldstein, 2006). A second set of trials, funded by Organic Valley Coop at the University of Minnesota, involved feeding up a layer flock and validating one cycle of their egg production (Goldstein et al, 2012; Jacob et al., 2008). In both cases the high methionine corn produced the same amount of poultry product as was achieved by feeding normal organic corn plus synthetic methionine.

Unfortunately, our *floury-2* varieties were too low-yielding for commercial use. Homozygous *floury-2* caused approximately 11% lower weight per seed. This reduction conditioned a corresponding reduction in grain yields. Even without *floury-2*, the yields of our cultivars were insufficient; there seemed to be no hope for farmer acceptance in the future with an additional 11% yield drag.

A third path emerged spontaneously in our breeding families with the unexpected occurrence of soft kernels in anomalous amounts (Goldstein et al., 2019). These mutations became apparent in 2006 and continued to emerge in multiple varieties. They were found in Nokomis Gold, in multiple GEM breeding lines (Jaradat & Goldstein, 2013; 2014; 2018), and in ex-plant variety protection inbreds. Their soft kernels were associated with reduced contents of the poor quality storage protein α-zein. But they had enhanced overall levels of better quality storage proteins that resulted in both higher percentages of methionine and lysine in grain and also in protein (Goldstein et al., 2019). In most cases, the soft, floury trait did not seem to be associated with a reduction in grain size or yield. They possessed moderate levels of protein (approximately 10% of the total dry weight) but compensated when protein was lower by producing a higher percentage of methionine in the protein.

These soft kernelled mutations have continued to emerge during the breeding program (Goldstein et al., 2019). Whenever they did, they were channeled into a path for inbred development that included sequential self-pollination, and selection for opaque kernels. Plants were grown and selected mainly under unfertilized conditions, with low quantities of nitrate and ammonium, to help encourage plants to find ways to utilize microbial sources for nitrogen.

We hypothesized that the plant regulatory systems would shift in response to our breeding and selection practices, and that some of those shifts would be epigenetically inherited (Goldstein et al., 2019). Subsequently, the trait may become stabilized by major gene action in a Mendelian fashion. Mutable inbreds in the three major heterotic patterns (LH123 in the Lancaster pattern, PHK42 in the Iodent pattern, A632 in the B14, stiff stalk pattern) all showed the same path of development in our program. This path involved: (a) spontaneous development of seeds showing opaque or piebald (opaque and translucent) seed; (b) occasional occurrence of chimaeras and other phenomena associated with transposon (jumping gene) activity in the foliage or grain; and (c) instability of the trait according to growing conditions. In the case of some of the unstable lines developed from these three inbreds, opaque floury kernels were expressed by plants when they were grown under N-limited conditions, but translucent seed were produced under conditions where corn was heavily fertilized with mineral N. In other cases, the trait was initially stable, or repeated selection led to stabilization of the soft kernel trait. In some lines, tests for allelicity showed that the trait is identical to the *floury-1* allele. This was a surprise, because previous research by others (Holding, et al., 2007) had not shown that *floury-1* causes higher methionine content in grain, but only a rearrangement of storage proteins in the protein bodies in the endosperm. In addition, we found that segregation ratios in crosses with non-floury corn were highly irregular and inconsistent. On the other hand, the accumulation of the methionine-rich δ- and β-zein storage proteins in the grain depends on the supply of sulfur-containing methionine from the plant. All this suggests that regulatory systems, a structural gene, and causal increases in the supply of methionine available to growing seed from the plant are jointly involved in the transition to production of the opaque phenotype in the grain of our cultivars.

The impact of the opaque kernels on nutritional value of the grain was studied with Abdullah Jaradat, USDA ARS, of Morris, MN, and professor

at the University of Minnesota-Morris. The soft kernel trait was also associated with higher density of macro- and microelements in the grain (Jaradat & Goldstein, 2018), especially, C, N, K, Mg, Mn, and P (Jaradat & Goldstein, 2013). Breeding lines and inbreds from the breeding program were screened for an accumulation of mineral nutrients in 2019 alongside a panel of commercial inbreds, and similar results were obtained as before, although the differences were most positive for the Mandaamin lines for K, Cu, Mg, Mn, and Zn (Goldstein & Jaradat, unpublished results, 2022). Later research confirmed that the link between opacity and mineral content is somewhat variable and not fully nutrient specific but seems to have to do with a general increase in nutrient availability to the developing seed (Goldstein et al., 2019).

The Search for N-Efficient/N-Fixing Corn

Separate nitrogen budgeting studies were carried out by the MFAI team for conventional hybrid corn grown on organic farms. The studies showed that in some cases there was excess N uptake that did not parallel mineral nitrogen and organic matter turnover rates as were currently conceived (Goldstein & Cambardella, 2008). These findings led to questioning whether variable interactions with N-fixing organisms might explain these discrepancies. Furthermore, our on-farm trials had shown that the protein content of grain was unstable from site to site. Perhaps inoculation with nitrogen-fixing bacteria might help stabilize protein content. In 2008, inoculation of MFAI cultivars with two *Azospirillum* species provided by the TerraMax company of Minneapolis increased grain protein content by approximately 1% under unfertilized conditions, but not under fertilized conditions (Goldstein et al., 2019).

In 2009, I grew cultivars with *Azospirillum* inoculum but under N-limiting conditions on an organically managed field that had been in cereal crops and had not been fertilized for at least four years (Goldstein et al. 2019). Cultivars tested included: (1) 15 ex-commercial inbreds or S1 to S3 generations of crosses between them, (2) 23 new commercial advanced breeding lines/inbreds from a cooperating seed company at the S5 to S7 level of inbreeding, (3) 26 breeding lines from the MFAI organic breeding program (S1 to S3), and (4) 13 exotic landraces obtained from the USDA ARS Plant Introduction Research and selected because of their unusually high methionine and lysine content. Groups 1 and 2 had been previously selected under conventional management. Group 3 was in development mainly from populations grown for multiple years under organic management.

The chlorophyll content of leaves parallels N content to a high degree, so determination of chlorophyll content with meters is generally used as a quick, practical way to determine whether the N uptake by the corn plant is sufficient or deficient. Leaf chlorophyll scores averaged 37 for the older commercial inbreds or recent breeding lines derived by crossing them, 40 for the new commercial breeding lines which were close to being finished inbreds, 45 for the early MFAI breeding lines derived from organically managed populations, and 54 for the exotic landraces. The percentage of lines within each group with scores of 50 or over (showing N sufficiency) were 8% for the conventional lines/inbreds, 34% for the MFAI breeding lines, and 65% for the exotic landraces. Multiple races from Mexico and South America produced dark green leaves with levels of chlorophyll scores in the high 50s and low 60s, suggesting that they had been heavily fertilized. Several of these varieties had invested less in root dry matter than adjacent conventional lines, so the difference could not easily be explained by having larger, more extractive roots.

Grains were tested for isotope composition utilizing the natural abundance method (Boddey et al., 1991). The decreased $\delta^{15}N$ signatures on N from grain samples indicated that some of the dark leafed landrace cultivars might have fixed up to half of their nitrogen from the air (Goldstein et al., 2019). On the other hand, isotope results also suggest longer-term selection of breeding lines under biodynamic/organic conditions increased in $\delta^{15}N$ isotope ratio in the grain and tops, which indicated greater accumulation of N from microbial biomass (Craine et al., 2015). Nitrogen fixation in corn has been shown occur by others (see review by Goldstein, 2016; and recent research on a Mexican landrace done by Deynze et al. 2019).

Understanding Microbial Partnerships and Rhizophagy

Following publication of results in 2019, I was contacted by Dr. James White, a plant biologist at Rutgers University, New Brunswick, NJ, who thought that he could explain many of my results with the concept of rhizophagy. Rhizophagy is a recently discovered, and not well understood, widespread plant/bacterial partnership associated with nutrient acquisition by plants (White et al., 2018). Endophytic bacteria live and multiply by budding in the periplasmic space of root cells located in root tips (White et al., 2018). The bacterial cells are buffeted by reactive oxidative substances (ROS) secreted by host cell plasma membrane oxidases. As the root cells age, the bacteria lose their cell walls and become naked protoplasts. Oxidation of the bacteria degrades cell walls and bacterial membranes, releasing proteins and minerals that are absorbed by the host cell. The surviving bacteria in older root cells stimulate production of root hairs. They are subsequently expelled by cyclosis out of root hair tips into the rhizosphere, where they grow cell walls again. Rhizophagy strongly stimulates root hair production, root branching, the production of root tips within which bacteria multiply, and N_2 fixation as measured by ^{15}N gas uptake by seedlings (White et al., 2018, 2019a, 2019b; unpublished research). The bacterial species involved in rhizophagy originate from the seed itself, but fresh soil bacteria are recruited into root cells behind the root tip in the zone of maximal root exudation. ROS induced by this partnership stimulates higher levels of plant resistance to stresses (Choudhury et al., 2017; Kandel et al., 2017). ROS in turn induces microbial production of methionine as a protective mechanism against oxidation (Arts et al., 2015; Luo & Levine, 2009), and thereby might affect methionine accumulation by plants. The increased supply of methionine, and hence its accumulation in non-zein and β- and δ-zeins instead of α-zein proteins, may explain the opaque phenotype and why it disappears in some opaque lines when the plants are fertilized with mineral sources of nitrogen. Hybrids that respond to N fertilizer have been found to respond to mineral N fertilization by increasing the concentrations of α- and γ-zeins and translucence in their kernels (Tsai et al., 1992).

Disinfection of the seed-borne bacteria associated with rhizophagy strongly reduced root branching and uptake of macro- and micronutrients (Irizarry & White, 2018; Verma, Kingsley, Bergen et al., 2017, Verma, Kingsley, Irizarry et al., 2017; Verma & White, 2018). Disinfection also stopped N_2 fixation in seedlings of maize (White et al., 2015; White, unpublished research).

The White lab at Rutgers found a high incidence of rhizophagy and enhanced root hair production in the roots of Mandaamin seedlings from different inbreds that were axenically grown. The putative N_2-fixing inbred C4-6 stood out among Mandaamin inbreds in appearing to have aggregates of bacteria embedded in a biofilm. Conventionally bred inbreds that were grown in the same breeding nursery lacked any sign of rhizophagy (Goldstein et al., 2020). These results supported earlier unpublished work by Dr. White.

Part 3. Research Coalitions and Their Achievements

Organic Corn Breeding Coalitions and the Formation of the Mandaamin Institute

During the first decade of the millennium, I made efforts to work with other small-scale corn breeders in a cooperative way. The efforts included seed exchanges with Frank Kutka, who bred early open-pollinated populations for northern climates in Wisconsin and North Dakota, often using exotic corn in his crosses, and with Carl Barnes from Turpin, OK, who selected native corn for distribution back to Indigenous people. The most robust relationship was with Herman Warren, a retired professor of plant pathology, internationally known for his work in breeding disease-resistant corn, who had worked for USDA ARS at Purdue University and at Virginia Tech University. Dr. Warren bred for decades, adapting Mayorbela, an extremely disease- and insect-resistant landrace from Puerto Rico to cultivation in the Midwest and Southeast. I was encouraged by his results: despite generations of inbreeding, many of Dr. Warren's disease-resistant inbreds maintained substantial vigor and still displayed some useful variation. I developed a

cooperative crossing and breeding program with Dr. Warren and also utilized the inherent instability in his lines for selecting opaque kernels and adapting for shorter-season Wisconsin conditions. Following Dr. Warren's death in 2015, I continued to work with his family to continue the cooperative breeding project at the Mandaamin Institute and to develop commercial grade inbreds and hybrids.

In 2009/2010 a coalition was formed with public breeders Linda Pollak (USDA ARS), Margaret Smith (Cornell University), and Richard Pratt (Ohio State University), and with private breeder Kevin Montgomery to seek funding together for a cooperative research program from the new Organic Agriculture Research and Extension Initiative (OREI) Organic Research funding opportunity, with Dr. Pollak as the principal director for the proposal. The grant was obtained, but in 2008 other USDA funds were reallocated away from the portion of the Pollak program that was devoted to corn quality research, leading to insufficient funds to support her program and necessitating some kind of consolidation. In 2010 Linda Pollak retired. Her role was taken over by Dr. Paul Scott, a USDA crop geneticist, who also managed a more lab-oriented program concerned with selecting populations.

In 2011 the breeding program under my direction was transferred to the Mandaamin Institute in Elkhorn, WI, which was founded by myself, in order to take the work further. The appropriation funding stayed with MFAI and USDA. The Mandaamin Institute was fortunate at this time to be receiving continued financial support from the NIFA grant, the Ceres Trust, private supporters, and local organic farmers. The support of the Ceres Trust has been especially critical for ensuring the continuation of the project to the present. The coalition of breeders continued their breeding and testing work together on all sites until 2020. The first grant received by the team (USDA NIFA OREI 2010-02363), "Strengthening public corn breeding to ensure that organic farmers have access to elite cultivars," ran 2010–2014. The main accomplishment was building the infrastructure required to support a public corn-breeding effort for organic production systems. Crucial infrastructure items included:

1. The United States Testing Network (USTN), a cooperative testing network that carries out agronomic evaluations of corn hybrids in both conventional and organic environments. This network gave public breeders and small private breeders access to evaluation resources comparable to those of large plant-breeding companies. This network became self-supporting.
2. A certified organic winter nursery, established with researchers at the University of Puerto Rico near Lajas, allowed corn breeders to produce two generations of corn a year, doubling the rate of gain of the programs that used it. An eOrganic webinar (Brunner et al., 2014) documented our approach to carrying out this winter nursery, which served as a critical resource for our second award.
3. A joint catalog of germplasm available to public researchers, which was the foundation for the breeding efforts carried out in subsequent breeding programs. Other products of the proposal included breeding families in various stages of development, 16 peer-reviewed scientific publications and other publications, and two graduate students and several undergraduates trained. Results were disseminated in field days, a website, and in lectures by the PIs.

The second grant received by the team (USDA NIFA OREI 2014-05340), "Breeding non-commodity corn for organic production systems," ran 2014–2019. This project took advantage of the infrastructure developed in the previous proposal to develop a germplasm pipeline for organic producers.

The focus of our breeding efforts was on traits of value to organic producers, including nutritional quality, native insect and disease resistance, N efficiency, ability to exclude GM pollen, and specialty varieties for food and feed. The cornerstone product of this project was a breeding study in which the best inbreds from each program were combined to form inter-institutional hybrids, which were evaluated by all

cooperators (Huffman et al., 2017). This study informed decisions about how best to use the germplasm resources of the group in cooperative breeding efforts targeting the specific traits of interest. Major products of the grant included inbreds at various stages of release that combine high methionine and cross-incompatibility traits needed by organic farmers, two germplasm releases, release and farmer use of three high-methionine, open-pollinated varieties and several high-methionine hybrids in larger-scale strip trials and production by farmers and one organic seed company, 14 peer-reviewed scientific publications, seven other publications, and a webinar on corn breeding. Two graduate students and many undergraduate interns received training. Results were disseminated through field days, our website,[1] webinars, and lectures and meetings featuring the principal investigators (PIs).

Another important accomplishment was elucidation of the molecular mechanism of the pollen exclusion trait by the Scott lab (Lu et al., 2020). Contamination by pollen from GM plants is a serious threat to organic seed producers, farmers, and consumer perception that organic feed and food is non-GM. One option for reducing risk is using the genes *Ga1* and *Tcb1*, found in teosinte (wild corn), in landraces of sweet and field corn, and in popcorn from Central America (De la Cruz Larios et al., 2008; Padilla Garcia et al., 2012), which convey gametophytic incompatibility or cross incompatibility. They minimize the chance of pollination by pollen that does not possess the same alleles. Corn can avoid GM contamination if it has these genes in a homozygous or, more rarely, in a heterozygous condition. Therefore, an area of common interest for three members of the team was developing commercial-grade varieties that had the cross-incompatibility trait. In particular, Paul Scott attempted to develop a genetic marker system for the cross-incompatibility genes. Cornell University, the Mandaamin Institute, and USDA ARS also developed cross-incompatible breeding lines. Our program was substantially assisted in its efforts to develop cross-incompatible corn through cooperation with Dr. Major Goodman of North Carolina State University, who had transferred a combination of *Tcb1* and *Ga1* from Mexican sweetcorn to Corn Belt corn (Jones, 2018) and helped us to transfer it from there to our corn.

Team members presented results from the project both in academic papers (Goldstein et al., 2019) and at academic and organic farmer conferences. Margaret Smith presented results at a NY Certified Organic Conference in 2020 and at an organic field day in 2019. In 2019, I presented results to farmers at organic conferences in Springfield and Champaign, IL, and in Shakopee, MN. All sessions included feedback from farmers. In 2019 findings of the Mandaamin research on breeding with microbes were presented at the Crop Science Society of America meetings, and Richard Pratt presented on landrace corn at the Rocky Mountain Seed Alliance Grain School.

Cooperating farmers participated in on-farm trials in MN, NM, NY, ND, SD, WI; in annual summer field days and winter open-house events in MN, NY, ND, WI, and in seasonal grower and university site visits in NM. WI events were attended by 40 to 90 people, mainly farmers. They included presentations from multiple OREI team members (Montgomery, Scott, Goldstein) followed by 1–2-hour discussion sessions to obtain feedback. In 2020, I presented information on the project to Northern Plains Sustainable Agriculture Society (NPSAS) farmers. Trials were run on five organic sites in MN, ND, and SD with early-maturing hybrids from the Mandaamin program in conjunction with NPSAS farmers and North Dakota State University. Members of the NPSAS Farmer Breeding Club and the NPSAS board attended field events and met in a special retreat with me.

Through field days and my talks, farmers have articulated a keen interest in obtaining seed and seeing our programs evolve to meet their needs. A few farmers in WI who have been testing the high methionine corn have reported that they want cultivars that combine competitive yields, high methionine and carotenoid content, N efficiency, and cross incompatibility to pollen from GM plants. GM contamination of corn can cause milk proces-

[1] http://eorganic.info/cornbreeding

sors to drop farms or shipped grain to be rejected, and restrictions have been tightened. Two organic farmers—Mark Zinniker, Elkhorn, WI, and Moses Beiler, Rewey, WI—are growing the high-methionine corn and have fed it, without synthetic methionine, to small flocks of layers. Beiler (personal communication, 2019) reported that egg production went up in comparison to feeding with a balanced commercial organic diet that included commercial hybrid corn grain plus synthetic methionine inputs.

Interaction has occurred with large and small companies, including those engaged in organic seed, feed, poultry production, and grain marketing. Long-term dialogue has occurred with a consortium of organic poultry companies, the Methionine Task Force, about the need for high-methionine corn hybrids that can yield competitively with commercial hybrids. Feedback from several large feed producers and consumers indicates that many large organic poultry companies seem afraid to use the high-methionine corn, probably because if they do the USDA will ban the use of synthetic methionine.

Extension and NRCS

The Mandaamin Institute has been testing its N-efficient/putative N_2-fixing corn with organic and conventional farmers, UW-Extension, NRCS personnel, and a citizen-based water quality group in Pepin County, WI, led by Dr. Micheal Travis. There is interest in reducing nitrate contamination of well water. Farmers have been encouraged by yield results with Mandaamin hybrids, when fertilizer inputs were reduced.

Seed Companies

During the period of the two grants and beyond, the Foundation Direct Seed Company (FDS) in Onalaska, WI, has helped the Mandaamin Institute to multiply seed of high-methionine, N-efficient inbreds and has produced hybrid seed in winter nurseries. In 2020, FDS and the Mandaamin Institute grew approximately 50 acres (20 hectares) of inbred or hybrid production seed corn for farmer trials near Onalaska and East Troy, WI. Since 2020, FDS has been marketing four of the Institute's high-methionine hybrids. The Mandaamin Institute is also allowing its inbreds to be used for breeding purposes by several European companies.

CASH Project

The Mandaamin Institute participated in a USDA NIFA OREI–funded grant managed by the University of Illinois (2017-02413), "Participatory breeding and testing The networks: A maize based case study for organic systems," that ran 2017–2022. Also called the Corn and Soil Health (CASH) project, the integrated multiregion project conducted advanced on-farm research to identify biophysical and social and legal factors influencing the performance of organic maize cultivars and their dependent businesses.[2] It was a participatory process that incorporated end users into research and Extension activities done in concert with eOrganic. The objectives were to strengthen the organic seed supply and develop client-oriented breeding networks and business structures that deliver high-yielding, nutritious, N-use efficient, and weed-competitive genotypes adapted to organic systems.

The CASH project built a participatory testing and breeding program, conducted a maize-based case study to explore on-farm factors influencing crop fitness and grain quality, and identified how closing the loophole on allowing organic producers to purchase conventionally grown hybrids might promote client-oriented breeding programs to improve organic seed supply. Important inputs included promising cultivars, experienced advisors, and significant farmer insights. On-farm research was carried out on corn hybrids and synthetics, while structured experiments were carried out to assess the effects of soil health and plant-soil interactions on crop fitness and grain quality.

In 2018 and 2019, the Mandaamin Institute hybrids were tested in IL, IN, and WI for yield and quality in strip trials on 32 sites. The high-methionine and carotenoid corn hybrid differed clearly from commercial hybrid checks by delivering significantly more methionine, carotenoids, and trace minerals at comparable yield levels. Methionine levels in the Mandaamin corn averaged 43% to

[2] https://cornsoilhealth.web.illinois.edu/wp/

57% higher than for the conventional corn. Dietary studies showed that use of the high-methionine corn in poultry diets would reduce the need for organic soybean meal and synthetic methionine and would enable a premium for grain that would displace some potential yield losses (University of Illinois, 2020; Goldstein et al, 2023). The value of extra carotenoids and minerals for poultry was not calculated.

The SARE Project

From 2017 to 2022, the Mandaamin Institute also carried out a project funded by USDA NIFA SARE, "Testing N efficient, high methionine corn hybrids with organic farmers," which utilized strip trials in tandem with the OREI:2017-02413 grant to do additional research on relationships between Mandaamin hybrids and nitrogen and mineral uptake dynamics. Results have been published in the form of a SARE report (Goldstein, 2022). The hybrids were studied in the context of different farming systems and soil fertility conditions. Studies with microscopy, field trials on different farms, and mineral and natural isotope analyses produced five key findings: (1) the plants exercised rhizophagy cycles with seed associated bacteria, leading to N-efficiency in field trials, high levels of $\delta^{15}N$ in tissues, and grain with higher protein and especially higher mineral contents; (2) these partnerships result in yields comparable to manured commercial hybrids, but no manure is added to the Mandaamin hybrids; (3) Hybrids with the Mandaamin inbred C4-6 as a parent particularly express these traits and also appear to fix N_2; (4) The C4-6-based Mandaamin hybrids also respond negatively to fresh manure (from various animals) but positively to high soil organic N and to high soil protein levels resulting from cattle manure applications in preceding years; (5) The negative effect of fresh manure applications on the C4-6-based hybrids extended to yield and mineral uptake, a problem exacerbated on soils with low organic matter content.

The work was made possible with the help of many organic and biodynamic farmers. USDA ARS at Morris, MN (A. A. Jaradat, Chris Wente, and Jane Johnson) did tissue analysis of corn for minerals and helped prepare samples for isotope analysis. Foundation Direct Seed Company (S. Mohr) contributed seed and advice. Rutgers University (J. White, A. Lotfi, K. Kingsley, and others) contributed rhizophagy research on maize seedlings, advice on interpreting our results, and continuous inspiration based on their research findings. University of Wisconsin Extension (Mike Travis) and Pepin County Conservation (Chase Cummings) helped organize farmer events and meetings around the issue of N_2-fixing corn and helped carry out on-farm research in NW Wisconsin. Wood Ends Soil Testing Lab and Cornell University assisted with extra soil quality tests. The Ceres Trust helped fund the project.

For some time, it remained a mystery why changes in the texture of grain should be associated with higher contents of nutrients, including minerals. Our results parallel findings at Rutgers that plants obtain extra N and minerals from microbial biomass in their roots (rhizophagy) while fixing N in their foliar tissues (Chang et al., 2021; Micci et al., 2022; Chang et al., 2023). Endophytes in foliar tissues and plant hairs are also bathed in oxidative substances, and nitrate is released around these bacteria. This dialogue of plants and microbes could explain both nitrogen fixation and the accumulation of methionine in grain, as both nitric oxide and methionine are potent antioxidants that can foster bacterial survival in an oxidative environment. We hypothesize that methionine production by the bacteria makes more of it available to the plant and increases the supply available for storage in grain proteins (Wu & Messing, 2012).

A New Project

A new OREI-funded grant, "Partnership breeding of corn for organic production systems," is enabling research from 2022 to 2024 together with Rutgers University and others. Recent research at the White lab at Rutgers has outlined the potential biochemical interaction between plants and endophytes living in epidermal trichomes and in epidermal cells and that this generates incorporation of nitrogen from the air (Chang et al., 2021; Micci et al., 2022). Initial research efforts show that within growing Mandaamin inbreds, nitrate-secreting bacteria are living in vascular tissues, in the profuse hairs in our cultivars, and in epidermal cells in

leaves and husks. The convoluted epidermal cells in the cultivars can harbor large colonies of bacteria that stain for nitrate production. In some cases, the bacteria in these cells have also been found to be bathed in ROS as in root cells. The bacterial consortium responsible for the trait has been transferred to conventional corn that does not have these bacteria. We do not yet know whether transference of this microbiota will carry over to the next generation of plants.

A new organically managed winter nursery has been established in Chile. Recent inspection in Chile of the Mandaamin inbreds bred for N efficiency suggest that the effects of evolution and selection are causing a convergent development of phenotypes in breeding families from widely different genetic backgrounds. Seedlings tend to possess profuse, even bottlebrush-like root hairs, while mature plants have healthy, profusely branched rooting systems in the topsoil. As selection and adaptation progress, plants are appearing that tend to produce hairy to pilose leaves and leaf sheaths, and thick, often folded and buckled leaves with high chlorophyll contents.

Part 4. The Value of the Effort and the Findings

The research results we have shown, and especially the return to utilization of endophytes (Chang et al., 2023) has substantial implications that could help US corn production to become more sustainable.

Context and Significance

This paper has documented the progression of a program that has produced nutrient-dense corn that obtains its nitrogen from microbial sources. The survival and development of the program has depended on numerous temporary partnerships between dedicated people and institutions, with relatively low investments in research funding and professional commitment by the publicly funded agricultural system.

To understand the significance of the findings, we should consider corn in the context of the present world situation. To live more sustainably and to mitigate climate change, humanity needs to find alternatives to the massive use of energetically and monetarily expensive and nonrenewable nitrogen fertilizer. Its breakdown product, nitrate, pollutes our groundwater and rivers and lakes, creates hypoxic dead zones in the oceans, and releases the potent greenhouse gas nitrous oxide into the atmosphere. Our political-economic system is currently locked in a paradigm that causes this systematic pollution. Conventional thought leads to no practical solution or major regulation that can reverse the trend. Corn, both the most productive cereal and the primary consumer of N fertilizer, has been selected for a century to depend on nitrate fertilizers. Corn is also the major field crop for organic farmers who use inputs such as chicken manure to provide the nitrate and ammonium that corn needs to produce high yields.

The Mandaamin Institute has bred corn that seems to grow well with neither direct applications of manure nor nitrogen fertilizer inputs. The partnership approach differs from the usual top-down mechanistic approaches in that it involved holistic attention and respect for what has turned out to be corn plants evolving in symbiogenesis with microbial partners (Goldstein, 2022; Chang et al., 2023). Initial studies indicate the resulting corn is competitive in yield, has better nutritional value, and obtains more of its nitrogen from microbial biomass and organic matter than does conventional corn. Its performance depends on plant/microbial partnerships that are seed-borne. These results are significant for breeders of other crops, who could utilize the philosophy and methods to improve quality and reduce needs for fertilizer and pesticide inputs.

There are multiple barriers to overcome. Yields of the better hybrids lag 10–15% behind conventional hybrids under fertilized conditions, although yields for the Mandaamin hybrids may be better under unfertilized conditions. This yield drag can possibly be overcome by more effort to improve the heterotic potential of the Mandaamin breeding lines through breeding that improves the combining ability of inbreds, measured by yield-oriented selection and greater emphasis on yield trials. The higher nutritional value of the corn results in savings for the poultry farmer in feed costs, with reductions in need for soybean meal and synthetic methionine. Results from the CASH trials showed

that the extra nutritional value in cost of feed could be transferred to the grain producer, enabling a sufficient markup in price of grain to offset the lower yield.

Another barrier is that some larger-scale organic poultry producers may be afraid that use of the Mandaamin corn will replace the need for synthetic methionine. Synthetic methionine is a relatively cheap input for farmers. Indeed, Mandaamin corn has the potential of reducing or eliminating the need for synthetic methionine. If the use of the high-methionine corn becomes widespread, as a consequence the USDA may then further restrict the use of synthetic methionine for feeding organic poultry. This would make organic poultry farmers dependent on high methionine corn, which might be more expensive, but would enable cost efficient feed due to a reduction in the need for organic soybean meal (Goldstein et al., 2023). Progress on this front depends on the proactive work by organic poultry industry and by USDA.

A third major barrier is the regulatory loophole in organic regulations that allows organic farmers to purchase conventionally-grown, non-treated hybrid seed. This loophole needs to be closed as it results in reduced investments in organic seed production as farmers purchase cheaper conventional seed from companies that do not have a demonstrated interest in breeding corn for organic agriculture.

Despite its obvious potential, efforts to further improve and implement the use of such corn as we have developed have received minor support. They deserve even stronger partnerships and investment in order to reduce problems with N fertilizer overuse. Organic poultry farmers need high-methionine, high-carotenoid corn grain, while organic corn producers need high-yielding, high-methionine corn hybrids that yield competitively. Therefore, it is important that more significant players in the agricultural industry begin to support the testing and introduction of the new kind of corn in the farming world, to take it to the next step.

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Food Resilience Toolkit in action

David Conner,[a]* Claire Whitehouse[b]
University of Vermont

Neishaly Serrano-Cortés,[c] Robinson Rodríguez-Pérez[d]
University of Puerto Rico at Mayagüez

Naomi Cunningham,[e] Travis Reynolds,[f] Kerry Daigle[g]
University of Vermont

Valery Desravins[h]
University of Puerto Rico at Mayagüez

Jane Kolodinsky[i]
University of Vermont

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Abstract

Food systems scholars and practitioners are increasingly prioritizing food system resilience (FSR) as a conceptual framework. FSR has been the guiding topic of an ongoing partnership between the University of Vermont (UVM) and the University of Puerto Rico at Mayagüez (UPRM), involving faculty, graduate students, and community partners from both regions to collaborate on research, education, and outreach. The first major output of the UVM-UPRM partnership is a Food Resilience Toolkit developed by faculty and graduate students at both universities, available in written

[a]* *Corresponding author:* David Conner, PhD, Professor, Department of Community Development and Applied Economics, University of Vermont; david.conner@uvm.edu

[b] Claire Whitehouse, Research Specialist, Center for Rural Studies, University of Vermont; Claire.Whitehouse@uvm.edu

[c] Neishaly Serrano-Cortés, Master of Science Candidate, University of Puerto Rico at Mayagüez; neishaly.serrano@upr.edu

[d] Robinson Rodriguez-Perez, Professor, Agricultural Economics & Rural Sociology Department, University of Puerto Rico at Mayagüez; robinson.rodriguez1@upr.edu

[e] Naomi Cunningham, Housing Program Administrator, Vermont Agency of Commerce & Community Development.

[f] Travis Reynolds, Associate Professor, Department of Community Development and Applied Economics, University of Vermont; twreynol@uvm.edu

[g] Kerry Daigle, Research Project Specialist, Center for Rural Studies, University of Vermont; kerry.daigle@uvm.edu

[h] Valery Desravins, Master of Science Candidate, University of Puerto Rico at Mayagüez; valery.desravins1@upr.edu

[i] Jane Kolodinsky, PhD, Professor, Department of Community Development and Applied Economics, University of Vermont.
Dr. Kolodinsky is now Dean, School of Business, Western Colorado University; jkolodinsky@western.edu

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and video formats in both English and Spanish. This research brief provides the results of an application of one component of the toolkit, an asset mapping exercise. We analyzed the results using the community capitals framework to highlight areas of strength and areas in need of investment. We found Vermont has assets to apply to FSR, with built, human, and social capital assets most numerous, while financial and political assets are fewest. We conclude with recommendations which can be vetted in future stakeholder gatherings and a call to apply the toolkit elsewhere.

Keywords
Vermont, Puerto Rico, community capitals, stakeholders, asset mapping

Introduction and Literature Review

In the face of frequent shocks caused by climate change and global pandemics, food systems scholars and practitioners are prioritizing food system resilience (FSR) in their work. The concept of FSR draws from the larger body of community resilience literature. Magis (2010) defines resilience as "the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise" (p. 401). Walker et al. (2007) characterize resilience as the ability to buffer disturbance. Narrowing in on food, Tendall et al. (2013) describe FSR as the "capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances" (p.19).

FSR has been the topic of many recent research and outreach efforts. Ferguson et al. (2022) framed FSR as a disaster preparedness strategy for island nations and emphasized increasing local food production and use, facilitated by strong networks. Campbell et al. (2022) created an audit tool for use by state and local government, food policy councils, and extension educators. This tool uses a socio-ecological systems approach as the theoretical framework, arguing that FSR is an integrated approach to understanding social, ecological, economic, and other systems. Their tool identified indicators of food resilience around seven core themes, including environmental sustainability, place-based economics, the importance of farmers and farmland, and fostering leadership and self-reliance.

Biehl et al. (2018) consider FSR in disaster preparedness in an urban setting, remarking that few cities have included food systems in disaster preparedness and resilience planning. Their analysis includes a fault tree to highlight the range and sequence of possible impacts, including supply chain failures (production failure, disruptions in processing, distribution and retailing activities) and circumstances where food is not economically (low income, high prices) or physically (unable to reach purveyors) available. The authors conclude that universities can foster collaboration and provide data to disaster resilience efforts, while acknowledging the difficulties in including broad segments of society and the complexity and unfamiliarity of the concepts.

FSR has been the guiding topic of an ongoing partnership between the University of Vermont (UVM) and the University of Puerto Rico at Mayagüez (UPRM). This partnership brings together faculty, graduate students, and community partners from both regions to collaborate on research, education, and outreach about FSR. The UVM and UPRM teams, along with colleagues at Clark University, came together to brainstorm a list of FSR indicators, drawing from the literature and personal experience. Inspired by the work of Magis (2010) on community resilience, we adopted the community capitals framework first developed by Flora et al. (2004), as our conceptual lens for this exercise. Flora et al. (2004) define seven forms of community capital: natural, cultural, human, social, political, financial, and built capital. We have mapped our hypothesized FSR indicators to the community capitals model in the list below. This list is present in the toolkit we developed (more discussion on this below) and was shown to participants in each presentation and workshop (more detail on this below) as part of the introduction to the exercise.

Natural capital:

- Fertile farmland
- Ecosystems services

- Clean water and fisheries
- Stable climate

Cultural capital:
- Foodways (healthful, regional, culturally appropriate)
- Credible leaders and champions
- Food citizenship ethos

Human capital:
- Labor and management capacity to produce and handle a diversity of food
- Adaptable workforce
- Communication skills
- Technical assistance

Political capital:
- Policies encouraging local purchases
- Regulations and adequate enforcement to protect workers, farmland, food safety, etc.
- Social safety nets ensuring adequate and appropriate nutrition for all
- Strong land tenure

Social capital:
- Trust within and between organizations
- Working partnerships and relationships
- Willingness and ability to share information

Financial capital:
- Credit access
- Emergency funds

Built capital:
- Food and farm business equipment and infrastructure able to handle diversity of products and adapt quickly
- Transportation infrastructure
- Reliable utilities

The first major output of the UVM-UPRM partnership is a Food Resilience Toolkit directed at extension and nonprofit professionals and community leaders. The toolkit was developed by faculty and graduate students at both universities and is available in written and video formats in both English (Serrano-Cortés et al., 2023a) and Spanish (Serrano-Cortés et al., 2023b). The first chapter of the toolkit introduces the concept of FSR and the community capitals model. The second provides four tools for assessment and planning: asset mapping, focus groups, nominal groups, and strategic planning. The third chapter examines the role of policy in supporting (or obstructing) FSR work. The toolkit concludes by summarizing lessons learned from our research efforts in both regions.

This research brief presents results from a trial run of the toolkit at a breakout session at Vermont's annual strategic food plan gathering. Specifically, it presents results of the assets mapping component, discovering what stakeholders perceive as assets to respond to a hypothetical future scenario. It builds on the work by Ferguson et al. (2022) and Biehl et al. (2018) by emphasizing FSR as disaster preparedness. Its intended users are similar to those of Campbell et al. (2022), yet with the community capitals model as a framework. Its application by the UPRM team can add to understanding of island locations' settings. The contribution of this paper is (i) mapping assets (ii) onto a community capital framework (iii) to address a potential shock (iv) by a statewide strategic planning organization. It integrates concepts and methods from previous studies including food resilience and disaster preparedness, community capitals, and mapping exercises within stakeholder collaboration groups; this integration is novel (especially in Vermont) to the best of our knowledge.

Applied Research Methods

After completing and publishing the toolkit, we performed a trial run at the Vermont Farm to Plate (FTP) Annual Gathering in November 2022. The Vermont FTP mission states: "Farm to Plate is Vermont's food system plan being implemented statewide to increase economic development and jobs in the farm and food sector, improve soils, water, and resiliency of the working landscape in the face of climate change, and improve access to healthy local foods for all Vermonters" (Vermont Farm to Plate, "Our Mission," para. 1). FTP holds a gathering each year to discuss and plan actions to achieve its mission. Authors David Conner and Claire Whitehouse applied for and were accepted to present at a breakout session. We chose the FTP Gathering because FTP's mission aligns closely

with our project and because it offered an occasion when a group with a unique combination of expertise and professional interest were already assembled.

The breakout session was attended by 22 people, including representatives from state and federal government agencies, nonprofit and technical assistance organizations, institutions of higher education, and UVM Extension. The majority of participants were white, female, younger professionals, a typical profile of food systems stakeholders in Vermont. After introducing the project and providing an overview of the toolkit, we reviewed the Asset Mapping protocol from Chapter 2 and led participants in an asset mapping exercise. We asked the group to consider the following scenario:

> *As a northern inland state, Vermont is positioned to be insulated from the most dramatic effects of the climate crisis, and is likely to receive an influx of climate refugees from both inside and outside the U.S. A large influx of refugees would require our small state to increase capacity on many fronts: housing, health care, and of course, food.*

In the event of rapid population growth caused by climate crisis:

- What **assets** could Vermont mobilize to "provide sufficient, appropriate and accessible food to all" (Tendall et al., 2015, p. 19)?
- Where are there **gaps**?

Participants broke into small groups to brainstorm possible assets and identify the gaps in their lists. After each group wrote up their asset and gap lists on flipcharts, we reconvened to present and discuss results with the full room. We gave them no further prompts, as part of the motivation was to understand how the participants named assets off the top of their heads without further guidance. After the event, two authors coded the flipchart notes to the seven community capitals and compared codes. We chose the capital that was the best fit, acknowledging that many responses could be placed in more than one category. For those that may fit in more than one capital category, the lead author assigned responses to a primary category and the second author suggested changes until consensus was reached. Full responses and codes are available upon request from the lead author.

Results

We mapped the responses from the Vermont Food Assets Brainstorm onto the community capitals categories (see Table 1).

Discussion

The responses above capture a snapshot of food resilience assets identified unprompted by a diverse array of food systems stakeholders in Vermont. We acknowledge that counting the number of examples under each category is not the same as measuring the strength or abundance of assets (there is no basis for stating that each mention has equal weight of importance, for example). We used this approach to understand how the participants named assets in this exercise. Nonetheless, it is interesting to note that the list of built assets is the longest. Human and social capital assets are also numerous, while financial and political assets are fewest within this framework. Yet although session attendees named many built and human assets, they also identified gaps in these categories. Based on their responses, the participants perceive that Vermont lacks both the expertise and infrastructure to feed a large influx of people through local production.

Like previous studies (Ferguson et al., 2022; Biehl et al., 2018) we found that FSR was a useful framework for thinking about disaster preparedness strategy, the need to increase local food production and use, and the importance of coordination through networks. Respondents reacted to the climate change risk scenario with both assets and gaps around local food production, distribution, and consumption (echoing Biehl et al., 2018, and their preparations around production and supply chain failures and lack of food access) and noted the value of Vermont's network of NGOs. We also collected the perspectives of a broad swath of stakeholders, including technical assistance providers (Extension educators and those from nonprofit organizations), state and federal government officials, researchers from higher education, as did Campbell et al. (2022). Unlike those studies, we applied the community capitals model (Flora et al.,

Table 1. Responses from Vermont Food Assets Brainstorm Mapped onto Community Capitals

Assets
Built
• Food banks
• Seed banks
• Perennial horticulture crops
• Urban farming
• Food access structures
• Processing and distribution infrastructure
• Old farm buildings, factories, second homeowners
• Transportation infrastructure (trains)
• Renewable energy infrastructure
Human
• Farming knowledge
• Farmer training programs (higher ed and NGO)
• Consumer education
• Workforce and workforce development, available jobs
• Indigenous knowledge
Financial
• Private investments in food business
• Public and philanthropic investments in food business
Cultural
• "Buy local" ethic
• Farm to table restaurants
• Indigenous foodways
Natural
• Farms and farmland
• Water resources
• Forests
Political
• Federal programs: Conservation Districts, Rural Development
• Planning and policy councils
Social
• Strong network of NGOs and other actors
• Granges and farmer organizations
• Community organizations: churches, common areas, schools
Gaps
Built
• Sustainable transportation
• Scale appropriate food processing
Human
• Acute labor shortage
• Poor working conditions, pay, and benefits
• Expertise in climate conscious and resilient production
• Expertise in food processing and preparation
• Indigenous knowledge
• Consumer awareness

2004), which highlighted that Vermont has many built capital assets that could be leveraged to improve food system resilience in the climate migration scenario.

While next steps were not part of our discussion in the exercise described above, we posit a number of recommendations which can be vetted in future stakeholder gatherings, based on the assets and gaps identified by the participants:

- Investment in workforce development and infrastructure for local and regional production, processing, and distribution. If and when Vermont does experience significant population growth, this infrastructure could help new Vermonters develop skills and find food system employment as well as access food.
- Improve working conditions and wages to make food jobs more desirable and less precarious.
- Maintain farmland and preserve water resources.

We acknowledge that these recommendations are not unique to Vermont or the modern day; rather, these are chronic needs in the food system that will become even greater under the climate migration scenario.

It is also important to note that the greatest number of identified assets (and all gaps) are in the built and human capital categories. These, along with natural capital and financial assets, may be the easiest to identify and name. In many cases they have implicit units of analysis (number of employees, dollars of investment, area of buildings and land). It may be that the respondents identified fewer assets and no gaps in the other capitals (social and especially political and cultural) because of lack of familiarity and because "investing" to increase stocks in these capitals involves deep changes in society which are difficult to quantify. Nonetheless, greater articulation of the existence and value of these more subtle capitals may help advance food system resilience efforts.

Conclusions

The recommendations for improving FSR in Vermont that we proposed above (investment in

workforce development and infrastructure, improved food system working conditions and wages, and farmland and water preservation) are neither new ideas nor easy to achieve. In Vermont, however, we are lucky to have existing statewide teams working on these goals under the auspices of the Vermont FTP Network, which already has priority strategy teams, topic exchanges, and communities of practice working to address each of these gaps. These collaborations will contribute to a more sustainable local food system and to broad community wellbeing, no matter which shocks come Vermont's way. Vermont FTP Network's existence is thanks to Vermont state government investment in local food infrastructure (political capital). This investment builds on existing social capital. To address the gaps in built and human capital would require policy and significant investment from government and businesses, and in some cases paradigm shifts (e.g., how we pay food labor, and subsequently how and how much we pay for food).

The major takeaways from the asset mapping and gap identification exercise are as follows. First, the topic (food system resilience) and background discussion on the partnership between UVM and UPRM drew a good crowd eager to participate. Second, the scenario we posed generated much discussion and many responses. Third, judging by the number of examples, respondents were most likely to name community capitals with identifiable units and clearer mechanisms for investment and measuring stocks. Fourth, assets and gaps in cultural and political capital may be more difficult to identify, yet the Farm to Plate Network is evidence of the state's stock in these capitals.

Limitations and Future Research Directions

These results are limited to a single group of stakeholders in Vermont at a single time. No generalizations or inference to other groups is advisable. Future research can focus on repeating the exercise in other regions, as well as testing the effects of prompts of assets within capital categories not identified in early rounds. We hope our toolkit and this paper spurs further work in this area, and we look forward to hearing about others' efforts and achievements.

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Developing a food system indicators database to facilitate local food systems assessments: Using a scoping review approach

Abiodun T. Atoloye [a] *
University of Connecticut

Sophie Schouboe,[b] Caitlin Misiaszek,[c] and Jamie Harding [d]
Johns Hopkins University

Kristen Cooksey Stowers [e]
University of Connecticut

Karen Bassarab [f]
Johns Hopkins University

Larissa Calancie [g]
Tufts University

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Abstract

Many food policy councils, food and agriculture-oriented groups, coalitions, organizations, funders, nonprofits, decision-makers, government departments, and other entities work to address local food system issues and inequities that negatively affect human, animal, and planetary wellbeing. In this article, we summarize and reflect on the process of creating an open-access food system indicators database. Our goal has been to create a library of indicators from which groups can draw when assessing their local food system, identifying

[a] * *Corresponding author:* Abiodun T. Atoloye, UCONN Rudd Center for Obesity and Health, Hartford, Connecticut.
Abiodun T. Atoloye is now Assistant Professor, Department of Nutrition, Dietetics, and Food Sciences, Utah State University; Logan, Utah, USA; +1-435-797-1586; abiodun.atoloye@usu.edu

[b] Sophie Schouboe, MPH Student, Center for a Livable Future, Johns Hopkins University, Baltimore, Maryland USA.
Sophie Schouboe is now Partnership Manager, United Way, Bay Area; San Francisco, California, USA; sschouboe42@gmail.com

[c] Caitlin Misiaszek, Program Officer, Center for a Livable Future, Johns Hopkins University; Baltimore, Maryland, USA.

[d] Jamie Harding, GIS Specialist, Food Communities and Public Health, Center for a Livable Future, Johns Hopkins University; Baltimore, Maryland, USA; jhardi14@jhu.edu

[e] Kristen Cooksey Stowers, Assistant Professor, UCONN Rudd Center for Obesity and Health and Department of Allied Health Sciences, University of Connecticut; Storrs, Connecticut, USA; kristen.cooksey@uconn.edu

[f] Karen Bassarab, Senior Program Officer, Food Communities & Public Health, Center for a Livable Future, Johns Hopkins University; Baltimore, Maryland, USA; kbanks10@jhu.edu

[g] Larissa Calancie, Assistant Professor, Friedman School of Nutrition Science and Policy, Tufts University; Boston, Massachusetts, USA; larissa.calancie@tufts.edu

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improvement opportunities, and evaluating their efforts. The indicators were extracted from seven sources selected to cover a wide range of food system elements and pertinent topics, including nutrition, agricultural production, racial equity, health outcomes, environmental impacts, and economics. Our work can contribute to needed research on monitoring and evaluating food system attributes and changes, developing a common set of indicators that groups can use to track food systems across places and over time and to assess racial equity, justice, and fairness in the food system.

Keywords
food system, monitoring and evaluation, equity, public health, collective impact, indicators

Introduction

A food system is a complex network of systems and processes that includes all inputs and outputs associated with agricultural and food production and consumption (U.S. Department of Agriculture [USDA], n.d.). The food system is dynamic and involves diverse actors, processes, and interactions in the production, aggregation, processing, distribution, consumption, and disposal (loss or waste) of food products (Healthy Food Policy Project, 2017; International Food Policy Research Institute, n.d.; von Braun et al., 2021). Despite a steady increase in food production across the country over the past 50 years (USDA Economic Research Service [ERS], 2020), the food system does not currently meet all Americans' food and nutrition security needs. In 2019, about 10.5% (13.7 million) of U.S. households were food insecure, meaning they lacked consistent access to reliable, safe, and appropriate food (Coleman-Jensen et al., 2020). About 46% of American adults have a suboptimal diet, or a diet that lacks sufficient nutrients (Rehm et al., 2016).

Moreover, six in 10 American adults have at least one diet-related disease, such as obesity, diabetes, or hypertension (Boersma, 2020), with a higher prevalence of diet-related diseases experienced by racial and ethnic minorities (Hales et al., 2017). Food production and distribution systems also impact health disparities through occupational and community hazards (e.g., exposure to industrial waste), which are disproportionately suffered by low-income, minority, and immigrant communities (Gochfeld & Burger, 2011; Lindgren et al., 2018; Institute of Medicine & National Research Council, 2015). Food system inequalities have a far-reaching negative impact on the environment, society, and ecosystems (McMichael et al., 2015; Shannon et al., 2015). For example, pesticides, methane, nitrates, and carbon dioxide emitted through food production and distribution affect soil health, air quality, and water quality and contribute to climate change (Landrigan et al., 2018). These issues and more need to be addressed to improve the food system in the U.S. However, assessing and measuring changes within the food system is challenging because of its complexity. Although we need to know whether activities aiming to improve the system are having an impact, selecting *what to measure* and *what data to use* are tough decisions faced by various groups working to address food system issues.

Food policy councils (FPCs) and similar groups are working to improve their local food systems by implementing programs, facilitating connections between individuals and organizations within their community, and advocating for policy change (Calancie et al., 2018; Eicher & Eicher-Miller, 2015; Franzen-Castle et al., 2021). FPCs are unique, as they comprise a network of members from different community and food system sectors (Eicher & Eicher-Miller, 2015; Franzen-Castle et al., 2021; Schiff, 2008). FPCs operate at different scales, including local, regional, and state levels. Their work may include fostering coordination

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between sectors in the food system, mobilizing residents to influence decision-makers, conducting local food policy evaluation, advising governments and institutions on policy, and/or supporting programs that address local needs (Eicher & Eicher-Miller, 2015; Harper et al., 2009; Palmer et al., 2020). Many councils, academics, consulting groups, governments, and other entities have developed reports, guides, scientific journal articles, and other resources employing various approaches and methods for evaluating community food systems (Abi-Nader et al., 2009; Bargainer et al., 2011; Freudenberg et al., 2018; Los Angeles Food Policy Council, 2020; Miewald, 2009; NYC Food Policy, n.d.). Existing resources include guides on how best to partner with community groups and collect data through primary data collection (Abi-Nader et al., 2009; Bargainer et al., 2011; Miewald, 2009). Other resources include reports or articles using data indicators important to the goals of their local jurisdiction (Freudenberg et al., 2018; Los Angeles Food Policy Council, 2020; NYC Food Policy, n.d.) and online resources for food system stakeholders to download and use data to assess and evaluate their food systems, such as the Maryland Food System Map or the Food Systems Dashboard (Fanzo et al., 2020; Global Alliance for Improved Nutrition [GAIN] & John Hopkins University, n.d.; Johns Hopkins Center for a Livable Future, n.d.-a). Reports or articles with specific suggestions on metrics to measure food system outcomes also exist (Campbell et al., 2022; Rodman-Alvarez & Colasanti, 2019). However, little information exists on standardized metrics or indicators to inform routine monitoring of community food systems (Schreiber et al., 2019). Furthermore, Ludden et al. (2018) highlight the need for continued development of metrics systems for our food systems.

Food systems are diverse and location specific; thus, attempts to make and evaluate changes and impacts should reflect the uniqueness of the locations and environments (von Braun et al., 2021). However, access to a consolidated set of food system indicators could provide a starting point for FPCs and other food system interest groups' evaluation efforts. This access could help save time and resources when identifying food system issues and deciding how to measure the impact of their initiatives. FPCs often operate with limited resources, so having one centralized place to look for food system indicators and ways to access or collect data about them could greatly benefit their work. FPCs and other food system interest groups might choose to adapt the indicators to fit their local cultures, ecologies, and economic structures or use a common set of indicators. Using common indicators would allow researchers and practitioners to compare the impact of food system initiatives across communities and identify the most effective initiatives in various community contexts. As suggested by the collective impact approach, using common metrics helps groups focusing on similar food system challenges align their efforts to have a concentrated impact on outcomes that matter to their communities (Frost & Stone, 2009; Kania & Kramer, 2011). Using a common set of indicators across groups combined with selected indicators that are particularly meaningful to a community could be an effective approach for advancing the science of food system change and ensuring it is relevant to those shaping and experiencing those food systems.

In this essay, we reflect on a step toward understanding the breadth of available food system indicators and the feasibility of creating a consolidated set of food system indicators. All the authors have experience working with FPCs and have heard consistently that councils struggle to assess the impact of their initiatives. This project was undertaken with FPCs and similar groups in mind. We report on our experience conducting a limited scoping review of food system indicator resources; developing a free, publicly available, searchable database of indicators we extracted during the review; and identifying opportunities to further develop food system evaluation resources. We anticipate that the database will be useful to FPCs, food and agriculture–oriented groups, coalitions, organizations, funders, nonprofits, decision-makers, and governmental and other entities working to improve elements of their food system and who are seeking to evaluate or keep track of their efforts.

Methods

We conducted a scoping review to identify reports that featured and recommended food system indi-

cators and then extracted indicators from a selection of reports to get a sense of the breadth of the indicators. The scoping review approach was selected because it is useful for rapidly identifying key concepts in a research area, sources of evidence, and research gaps (Colquhoun et al., 2014). Using the steps described below, we aimed to identify a sample of resources that featured a range of food system indicators that would be a useful starting point for creating a list of recommended indicators using the steps described below.

Search Methods

To identify resources mentioning food system indicators, from September to November 2019, we conducted a search of the phrase "food system indicator" in Google Scholar and "food system indicator" or "food system metrics" in Google Web Search Engine. We also searched for resource recommendations from the Johns Hopkins Center for a Livable Future's Food Policy Networks resource database (Johns Hopkins Center for a Livable Future, n.d.-b) and the CDC-funded Nutrition and Obesity Policy Research and Evaluation (NOPREN) Food Policy Council Working Group. We first identified 24 resources with information on indicators or methods for measuring the food system, including databases, guides, tools, and frameworks. We selected a subset of seven resources that offered the broadest coverage across the food system. Table 1 presents the characteristics of the included reports. The included reports were published between 2015 and 2019 and had a range of 13–128 indicators each. These reports covered a variety of food system components, such as agricultural production, racial equity within the food system, health outcomes, participation in federal nutrition programs, environmental impact, and agricultural economics. Two reports were global in scope, three focused on the U.S., and two were specific to U.S. states.

Data Extraction

Food system indicators were extracted from reports and added to the emerging database exactly as they appeared in each report. Additional information for each indicator, such as geographic scale, data source, frequency of update, and example of use, was added to the database. To gain insight into how to organize the indicators in a user-friendly

Table 1. Characteristics of Reports From Which Food System Indicators Were Extracted

Report title	Institution	Publication year	Scope	Number of indicators
State Level Food System Indicators	University of Minnesota	2016	State	124
Oregon's Community Food Systems Indicators	Oregon Community Food Systems Network, the Oregon State University Center for Small Farms & Community Food Systems, and Rural Communities Explorer	2016 (updated in 2018)	State	53
IOM Report: A Framework for Assessing the Effects of the Food System	The National Academies of Science, Engineering, and Medicine	2015	Country	36
SNAP-Ed Evaluation Framework	USDA SNAP-Ed Program	2016	Country	21*
Measuring Racial Equity in the Food System: Established and Suggested Metrics	Center for Regional Food Systems, Michigan State University	2019	Country	86
Global Nutrition Report	Global Nutrition Report Stakeholder Group (published by the International Food Policy Research Institute [IFPRI])	2015	Global	20
Milan Urban Food Policy Pact Monitoring Framework Indicators	Milan Urban Food Policy Pact	2019	Global	44

* 21 indicators were drawn from food system–related domain of the SNAP-Ed evaluation framework.

manner, we received feedback from a convenience sample of FPCs and individuals who provide technical assistance to councils as well as from the NOPREN working group members and an expert in design thinking at Tufts University. The project team used feedback to revise the database to be primarily organized and easily searchable using keywords. The team also received feedback to provide an example of how keywords could be used in coordination with food system frameworks.

The keywords for each indicator were categorized into three phases. First, an initial list of keywords was created with words pulled directly from the indicators and written in their singular form (e.g., "farm" rather than "farms"). Second, a keyword list was created that listed each keyword pulled from the indicators and a short list of commonly used synonyms or words or phrases with similar concepts for that keyword. For example, "SNAP" had synonyms such as "federal nutrition program" and "food access." This keyword list was reviewed by all team members and provided a standardized approach for adding keywords to indicators. For each indicator, synonyms were included in the keyword list if they were relevant to that indicator. For example, the final list of keywords for the indicator "Number of farmers markets accepting SNAP" included "farmers market," "SNAP," "local," "food retail," "food environment," "food access," and "federal nutrition program." The keywords act as tags for indicators and can be used to search for indicators related to a specific topic. On a separate tab in the database, the team sorted keywords into nine domains. Six of the domains include "justice and fairness," "strong communities," "vibrant farms," "healthy people," "sustainable ecosystems," and "thriving local economies" according to the Whole Measures for Community Food Systems framework (Abi-Nader et al., 2009). The three additional domains are food supply chain, food access, and racial justice. "Justice and fairness" refer to salient themes in the food systems with a broader emphasis on equity considerations, including but not limited to race and ethnicity, whereas "racial justice" describes topics related to justice and equity that are narrowly focused on race and ethnicity. Two research team members categorized keywords according to the domains, and then the rest of the team reviewed the categorization. Any disagreement about categorization was discussed and resolved through consensus. The Whole Measures framework is a community engagement tool that reflects social and economic values of equity and well-being in addition to conventional agricultural indicators (e.g., pounds of food produced). We sorted the indicators in the database according to the framework to allow FPCs and other interest groups to more easily search the database based on the framework's domains, since the groups we spoke with reported using that framework to guide their work. For example, "cultural competency," "demographic," and "Black" were some indicators categorized under the "justice and fairness" domain. "Affordability," "availability," and "access" were some of those under the "strong community" domain, and "anemia," "air quality," and "diet quality" were under "healthy people."

Results

An extensive set of 384 indicators spanning many aspects of the food system were extracted from the seven reports in the scoping review. After removing exact duplicates, the database included 381 unique indicators. The Food System Indicator Database[1] (Schouboe et al., 2021) and user guide[2] are free and publicly available. There is a written user guide as well as a video showing how to use the database.

A total of 291 unique keywords were assigned to the 381 indicators. The Appendix shows an example of how the keywords were organized into eight food system–related domains drawn from the Whole Measures for Community Food Systems framework. The keywords span all aspects of the food system, from production, processing, distribution, and disposal to the economic, environmental, social, and health impacts of food systems.

Data availability sources vary for the included indicators. Some indicators are suggested but lack a

[1] https://airtable.com/shrK9MVR7l5BYZ8JS
[2] https://nopren.ucsf.edu/sites/g/files/tkssra5936/f/wysiwyg/Food%20System%20Indicators%20Database%20User%20Guide_8.26.21.pdf

specific data source. Others need primary data collection or require a combination of secondary datasets or calculations. For example, of the 86 indicators listed in the Measuring Racial Equity in the Food System report, 27 require new data collection using surveys or interviews; 29 are from secondary databases like the U.S. Bureau of the Census and the USDA Census of Agriculture; one combines both primary and secondary data; and 29 others are simply suggested concepts that have not been fully defined or measured (Rodman-Alvarez & Colasanti, 2019).

Discussion

In summary, we identified resources mentioning food system indicators, extracted indicators, and assigned keywords to indicators to create a free, searchable database of food system indicators. We anticipated identifying and removing duplicate indicators during the review process, aiming for a concise selection of recommended indicators. However, the reports we examined contained a significantly higher number of distinct indicators than we had initially expected. The results from our small sample show high variability in the content of reports containing food system indicators. The food system indicators identified in this study span multiple topics, such as nutrition, agricultural production, racial equity within the food system, health outcomes, environmental impact, and agricultural economics. The database developed during this research process and referred to in the manuscript will give FPCs and other food system groups a sample of available indicators and will indicate whether existing data is associated with those indicators. Gathering this information in one place with a guide and video showing how to use the database can help groups measure their impact in the way that best fits their goals. Human-centered design thinking is an iterative process where community members and other stakeholders design solutions that meet their needs (Barlow & Lévy-Bencheton, 2018). That process and other community engagement approaches could be applied to identify or co-create meaningful food system indicators that are not currently in the database. On a practical note, it is important to keep in mind that engaging community members is an ongoing process that takes time, resources, and trust (Freedgood et al., 2011).

There were no duplicate indicators that used exactly the same words, a finding that surprised the project team. However, a few indicators measured the same concept in a different dimension or context. For example, "availability of farmers' markets" was an indicator in the IOM report, while the report titled "Oregon's Community Food Systems Indicators" used "number of farmers' markets." Another example is the "number of grocery stores" in the "Oregon's Community Food Systems Indicators" report and "number of grocery stores per 10,000 people" in the "State-Level Food System Indicators" report. The last example is the indicator "Households participating in SNAP, by race/ethnicity, relative to the portion of all households in the state, by race" in the "Measuring Racial Equity in the Food System: Established and Suggested Metrics" report, "SNAP participation (percent of individuals participating in SNAP)" in the "Oregon's Community Food Systems Indicators" report, and "Percent population receiving Supplemental Nutrition Assistance Program (SNAP) benefits" in the "State-Level Food System Indicators" report. This finding underscores challenges facing FPCs and similar organizations trying to assess, monitor, and evaluate initiatives within their food system: what indicators should these groups use, and how might these groups identify a concise set of meaningful indicators that can be compared across places and over time?

Multiple keywords were often assigned to indicators. For example, multiple keywords were assigned to the indicator "Retail Food Environment Index (RFEI) by the percentage of residents of color in the neighborhood," such as retail, food environment, residents of color, food retail, business, race, racial equity, racial justice, justice, and fairness, index. For the indicator "Number of farm operators by race," farm, operator, race, agriculture, production, racial equity, racial justice, justice and fairness, and producer were assigned. This underscores the complexity of the food system, where concepts such as labor, natural resources, and health interact, shape, and are shaped by the system. The emergent conditions of the food system are a feature of complex adaptive

systems (Chapman et al., 2017). Systems science evaluation methods are particularly useful for studying complex adaptive systems and how they respond to initiatives that groups like FPC might implement. One report included in this study, the IOM's *Framework for Assessing Effects of the Food System*, describes multiple systems science evaluation techniques that can be applied in food systems research and includes examples of their application (Institute of Medicine & National Research Council, 2015). Councils and similar groups might seek evaluation support from university partners or nonprofits that specialize in using systems science methods to study food systems. If evaluation bandwidth is limited, councils may still benefit from drawing out and discussing *how* food system indicators like those identified in this study interact and shape conditions they care about in their communities. Developing a shared understanding of the mechanisms at work in a complex system can empower groups to find opportunities for meaningful change. The shared understanding can facilitate communication within and beyond the group (Black & Andersen, 2012).

Another finding from this review is the limitations on data availability. Even when appropriate indicators have been identified, they may be of little use to FPCs and similar groups if there is no existing data linked to those indicators since many groups have minimal capacity to collect primary data or to use large, complicated datasets. In those cases, FPCs and other groups might seek partnerships with researchers, government departments, school systems, cooperative extensions, and other entities that may have the skills and resources to collect and analyze relevant data.

Recently, there has been increased public interest in diversity, racial equity, justice, and fairness issues across the different sectors in the U.S., with a push for policies and practices that promote racial equity (Chui et al., 2021; The White House, 2021). Many FPCs and similar groups are working to promote such policies and practices in the food system. However, they cannot track and evaluate progress due to a lack of readily available data on racial equity, justice, and fairness within the food system. Data that can be disaggregated by race, ethnicity, gender, age, and other characteristics must be available to assess and address disparities within food systems (Rubin et al., 2018; United Nations Human Rights, Office of the High Commissioner. 2015).

This study has limitations. First and foremost, we acknowledge that we had limited resources to conduct this review and thus only included a small subset of the many resources that include food system indicators. Future research using a comprehensive search strategy to identify other food system indicators and a study of food system assessments is warranted. The results from our sample show that there is high variability in the content of reports containing food system indicators. Therefore, it was not feasible for our small team to conduct a systematic review of all indicators or systematically narrow the list to a manageable set of common indicators we could recommend here. This project intended to identify and catalogue a list of food system indicators; it did not address the challenges regarding time and resources to collect local data. Not all recommended data indicators will exist for every community, so finding indicators listed in the database for a specific community or jurisdiction may still be challenging. In addition, local community input on defining, collecting, and measuring important food system concepts is not addressed through this database. However, it is a necessary component to understand and evaluate food system change.

Despite these limitations, our study identified almost 400 indicators spanning the food system, resulting in a publicly available, searchable database of those indicators. Our findings show the breadth of topics and outcomes associated with the food system. They can serve as input to future studies that employ artificial intelligence and other techniques to systematically and comprehensively identify food system indicators that could be used to assess, monitor, and evaluate initiatives within the food system.

Recommendations

The results highlight the need for more research and resources available for groups looking to assess their food systems and evaluate their efforts to improve them. The number of indicators identified from this limited scoping review underscores the

complexity of the food system and the challenges facing FPCs and other groups when deciding how to assess their food system and how to evaluate their initiatives. Our findings highlight the need to approach monitoring and evaluation with a trans-disciplinary team if the goal is to create a holistic view of a local food system. While groups could adapt the food systems indicators to their local context, using common indicators for similar contexts/scenarios would allow scientists and practitioners to further aggregate data and/or compare trends across communities and over time. With more resources, the database could be routinely updated and serve as a first step toward a common platform where food system indicators could be identified, data for those measures extracted from existing databases, and information presented according to users' needs. Creating user-friendly data access and integration platforms can help FPCs and other groups advance food system change, ensuring sustainable, equitable access to foods that support nutrition security, health, and well-being.

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Appendix. Keywords Organized into the Whole Measures for Community Food Systems Framework Plus Three Additional Domains (Food Supply Chain, Food Access, and Racial Equity

Justice and fairness	Strong communities	Vibrant farms	Healthy people	Sustainable ecosystem	Thriving local economies	Food access	Food supply chain	Racial equity
access	access	agriculture	access	air quality	acquisition	access	acquisition	African American
adult	affordability	animal	air quality	by-product	advertise	affordability	citizenship	Black
affordability	assessment	beef	anemia	carbon	affordability	assistance	consumer	discriminate
African American	assistance	berries	blood mercury	carbon dioxide	board member	benefit	convenience store	discrimination
age	benefit	by-product	BMI	cattle	budget	cost	distribution	disparity
assistance	board member	carbon	body mass index	chemical	business	evaluation	evaluation	ethnicity
benefit	budget	carbon dioxide	cholesterol	climate change	CEO	federal nutrition program	food store	evaluation
Black	business	cattle	diabetes	CO2	communication	food insecurity	food venue	justice and fairness
child	CEO	cereal	diet	conservation	compensation	hunger	grocery store	monitoring
citizenship	citizenship	chemical	diet quality	cow	control	income	manufacturer	Native American
community of color	community	climate change	disparity	crop	cost	low income	manufacturing	owner of color
compensation	community-supported agriculture	CO2	evaluation	dairy	customer	monitoring	market	people of color
control	control	community-supported agriculture	federal nutrition program	emission	development	poverty	marketing	race
cost	crisis	cow	food	energy	director		monitoring	racial equity
cultural competency	cultural competency	crop	food access	environment	earning		processing	racial justice
demographic	development	CSA	food deficit	erosion	economic		processor	racism
demographics	director	dairy	food insecurity	evaluation	economy		procurement	residents of color
discriminate	disaster	erosion	food preparation	fertilizer	employee		producer	white
discrimination	discriminate	evaluation	health	GHG	employer		production	
disparity	discrimination	farm	healthy food	greenhouse gas	employment		snack store	
employee	disparity	farm box	hunger	land	evaluation		supply chain	
employer	earning	farm share	illness	livestock	executive		transport	
employment	economic	farmer	inequality	locally grown	expenditure		waste	
equality	economy	farmers market	inequity	manure	expense			

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Justice and fairness	Strong communities	Vibrant farms	Healthy people	Sustainable ecosystem	Thriving local economies	Food access	Food supply chain	Racial equity
evaluation	education	fertilizer	infant	meat	facility			
federal nutrition program	employment	fruit	injury	monitoring	finance			
food access	equality	goat	labor protection	organic	financial			
food deficit	ethnicity	grain	meal	pesticide	funding			
food desert	evaluation	hog	medical	pollution	GDP			
food environment	executive	immigration	monitoring	recycling	Gross domestic product			
food insecurity	food access	lamb	mortality	resilience	growth			
food loss	food deficit	land	nutrition	soil	institution			
food movement	food desert	livestock	obesity	sustainable	job			
gender	food environment	local	occupational health	tribal area	labor			
hunger	food hub	locally grown	occupational injury	waste	labor protection			
immigration	food movement	manure	overweight	water	local			
income	funding	meat	racial equity	water quality	locally grown			
inequality	garden	melon	racial justice	wind	manager			
inequity	gender	milk	racism		market			
infant	government	monitoring	recall		marketing			
internet access	grant	nut tree	recovery		monitoring			
jail	healthy food	organic	safety net		ownership			
job	housing	pesticide	SNAP		payroll			
justice and fairness	hunger	pig	socially vulnerable		resilience			
labor protection	immigration	pork	stunted		trade association			
loan	incentive	poultry	underserved		work condition			
low income	income	produce	value added		worker			
mobility	inequality	producer	water		worker of color			
monitoring	inequity	profit	water quality		workforce			
Native American	infrastructure	protein	WIC					
occupational health	institution	rancher	work condition					
occupational injury	internet access	regional						
owner of color	labor protection	resilience						

Justice and fairness	Strong communities	Vibrant farms	Healthy people	Sustainable ecosystem	Thriving local economies	Food access	Food supply chain	Racial equity
ownership	law	root						
pay	leadership	soil						
payment	legislation	sustainable						
payroll	loan	tree nut						
people of color	manager	vegetable						
policy	mobility	water						
population	monitoring	water quality						
power	municipal							
profit	owner of color							
race	ownership							
racial equity	poverty							
racial justice	power							
racism	preparedness							
regulation	profit							
residents of color	resilience							
rights	school							
safety	stability							
safety net	sustainable							
sex	trade association							
SNAP	transit							
socially vulnerable	transport							
underserved	transportation							
union	tribal area							
vulnerable	underserved							
wage	union							
white	white							
WIC	zoning							
women								
work condition								
worker								
worker of color								
youth								

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Exploring the implications of the Fair Trade USA certification for farmworker health and well-being at the first certified farm in the U.S.

Alissa Bilfield [a] *
University of Washington

Edmundo Hernandez [b]
University of Arizona

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Abstract

Decades of interdisciplinary research suggest that fair trade certification may have significant implications for the development of more equitable and sustainable agricultural practices. The certification was originally established to support smallholder farming cooperatives in developing countries. However, a recent organizational division separating Fairtrade International from Fair Trade USA has created a bifurcation in certification standards.[1] Under the new Fair Trade USA program, the first domestic certification standard for U.S.-based farms is now being implemented. The aim of this study is to understand the impact of the new certification on farm operations and farmworker well-being at the first U.S. fair trade-certified farm, from the perspectives of farmworkers, farm management, and the supply chain. The initial findings

[a] * *Corresponding author*: Dr. Alissa Bilfield, Assistant Teaching Professor, Food Systems, Nutrition, and Health, Nutritional Sciences Program, Department of Environmental and Occupational Health Sciences, University of Washington School of Public Health.

As of January 1, 2024, Dr. Bilfield is at the A.B. Freeman School of Business, Tulane University; abilfiel@tulane.edu

[b] Edmundo Hernandez, PSM Applied Biosciences, University of Arizona.

Declarations

This study was approved by the Internal Review Board of the University of Arizona in Tucson, Arizona. The procedures used in this study adhere to the tenets of the Declaration of Helsinki..

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[1] For the purpose of this paper, fair trade is used to refer generally to the concept, whereas in the case of specific organizations and/or their certifications, other spelling is used. For example, Fair Trade USA and Fair Trade Certification, versus Fairtrade International and Fairtrade Certification.

from this limited exploratory study indicate that the certification can be used as a tool to improve farmworker empowerment while also providing material benefits and resources. More research is needed to determine the long-term impact and feasibility of more widespread implementation.

Keywords
fair trade, farmworkers, sustainable agriculture, agricultural justice, certification

Introduction

Since the first fair trade certification was implemented, 1.6 million farmers and workers have participated in the fair trade system and global sales have reached US$8.95 billion (Fairtrade International, 2023). Decades of organizing culminated in the creation of certification systems in the late 1990s with corresponding consumer-facing labels (Raynolds et al., 2004). However, from its inception in the early 20th century, the fair trade movement was conceived more broadly as a means to provide a market for small producers and artisans in developing countries (Kituyi, 2014; Redfern & Snedker, 2002). The creation of a fair trade certification was envisioned more radically, to serve as a development mechanism to address the structural inequalities of modern agriculture in the developing world. Unjust land tenure policies, inhumane working conditions, child labor practices, gender inequality, and poor environmental standards were just a few of the issues that were meant to be addressed through certification (Becchetti & Costantino, 2008; Raynolds, 2002; Thomas & Oliver, 2020).

Initially, only farmer organizations composed of small holders, such as agricultural cooperatives, associations, and federations, were eligible to certify their commodities as fair trade (Nicholls & Opal, 2005; Sandro et al., 2008). Through the various certification systems that have developed, these producer organizations have been guaranteed a fair trade minimum price as a protection against the uncertainties of the market economy. In addition, fair trade certifications provide producer organizations an annual social premium that is reimbursed to fund democratically determined projects. Social premiums have helped to support initiatives such as community health projects, education scholarships, and reinvestment back in their production processes (Castaldo et al., 2008; Nicholls & Opal, 2005).

Between 2011 and 2012 the main fair trade organization, Fairtrade International, officially split, and a separate organization, Fair Trade USA emerged with divergent standards. This split was emblematic of prior issues in the fair trade movement that had already led to the establishment of several different fair trade labels, with their own varied approaches to supporting their visions of fair trade through certification. The rift within Fairtrade International occurred over a philosophical difference regarding who should be certified. Fairtrade International wanted to continue to certify only small-holder organizations, which are cooperative associations whose members are farmers with small parcels of land, usually 2–5 hectares, thus providing market access to small-holder farmers in developing countries. Fair Trade USA, however, was open to certifying large-scale operations that predominantly employ farmworkers, supporting a philosophy they branded as "Fair Trade for All." Both organizations maintain a commitment to the original standards, but Fair Trade USA believed that while supporting small-holder farmers is an important mission, a large number of agricultural wage workers remained unprotected that could benefit from the support of the fair trade model (Jaffee & Howard, 2015; Fair Trade USA, 2023b).

This difference of approach caused a fundamental bifurcation of the fair trade movement, with changes in the landscape of fair trade certifications. The global group viewed the inclusion of large-scale commercial farms as incompatible with the core values and goals of fair trade, which had been to support and provide markets for small-holder farmers (Jaffee & Howard, 2015). Fair Trade USA cited three major reasons for shifting to "Fair Trade for All." The first was to reduce inconsistencies that already existed in certification of plantation-grown products such as bananas and tea that had been eligible for the certification process (Jaffee, 2018). The move to include plantation-grown coffee was arguably the most controversial, since it had been excluded until the bifurcation (Cater et al., 2016). Second, by expanding the fair

trade market a greater number of farmers and farmworkers would benefit through improved labor laws, access to health care, and better living conditions. Third, Fair Trade USA further asserted that fair trade was just scratching the surface of inequity in the agricultural labor market; by broadening the certification to cover agricultural wage workers, whether they were working on plantations or on small-holder land, more expansive humanitarian improvements could be realized (Bilfield, 2020; Walske & Tyson, 2015).

As the fair trade movement has evolved, market-based incentives have been combined with infrastructure and governance processes to undergird the certification process (Raynolds et al, 2004). This framework varies between fair trade organizations, yet retains the consistent goal of reforming global agricultural markets. In the case of Fair Trade USA, a certification process exists for producers, processors, and retailers. Once certified, farms receive the fair trade "sustainable cost of production" premium, in addition to social premiums that are redistributed back to the farmer or farmworker organization. In the case of a Fair Trade USA–certified farmers cooperative composed of smallholders, the cooperative organization facilitates the process of allocating the social premiums to collectively designated projects and programs. In the U.S. this is the exception, and a new protocol has been established to create a democratically elected fair trade committee composed of peer farmworkers to fill in this governance gap (Fair Trade USA, 2023a). Democratically elected by the farmworkers to represent them and to communicate to farm management and outside stakeholders, the fair trade committee convenes the workers on a regular basis to discuss work-related issues, and organizes and facilitates the process for collectively deciding how to use the annual fair trade premiums allocated to the farmworkers.

The modern agricultural labor market in the United States is rooted in the exploitative colonial plantation model of agriculture (Koreishi & Donohoe, 2010), built on slavery and relying on free and then indentured labor to generate dehumanized agricultural production in favor of volume-oriented economies of scale (Wright, 2003). The last century has witnessed significant shifts in this model, but labor practices remain a challenge for systemic reform because most forms of agriculture still rely on large-scale industrial production methods dependent on abundant and cheap labor. As a result, by far most agricultural work in the U.S. is composed of seasonal or wage work by a predominantly migratory population. While significant regulatory infrastructure has been established to protect farmworkers, evidence demonstrates that their employment remains precarious (Areguin & Stewart, 2022; Keim-Malpass et al.2015).

The purpose of this study is to understand the dynamics of the new domestic fair trade certification administered by Fair Trade USA as it impacts farm operations and farmworker well-being at the first certified U.S. farm. This research applies the theoretical framework of sustainable supply chain management in combination with the capabilities approach of Amartya Sen (1999). At the systems level, sustainable supply chain management conceptualizes the relationship among environmental, social, and economic performances within a supply chain management context (Carter & Rogers, 2008; Montgomery et al., 2012). At the individual level, the capabilities approach provides a more robust understanding of human development outcomes, beyond simple measurement of economic benefits. In addition to assets and resources, the capabilities approach also characterizes a person's autonomy, agency, and abilities as crucial to health and well-being (Sen, 1999).

This research has three specific aims. First is to understand how farm management and other farm stakeholders perceive the fair trade certification and to discover how the new certification practices may affect farm operations related to labor. Second is to explore the experience of farmworkers on the first fair trade-certified farm in the U.S. and to understand how certification has shaped their labor-related experiences and impacted their livelihoods. The third aim is to explore the labor policy implications of the fair trade certification program for the agricultural sector in the U.S. and beyond.

Methods

This mixed-methods research study was approved by the IRB at the University of Arizona in Tucson, Arizona. Data collection and analysis occurred

between March 2020 and July 2021. Multiple research methods were used to enhance the depth, accuracy, and rigor of the findings (Johnson et al., 2020). Each method used a different approach for data generation, e.g., drawing on responses from surveys, semi-structured interviews, and document analysis (Creswell, 2013). Two distinct populations were involved in the study: farm administrators and value chain actors connected to the farm, and farmworkers. The first population included value chain actors and institutional representatives associated with the fair trade-certified farm. Value chain actors included processors, distributors, wholesalers and retailers that work with the farm. Institutional representatives include farm employees involved in human resources, corporate social responsibility, sustainability, and management. specific individuals in farm management are involved in the fair trade certification process, purposive sampling was employed in collaboration with the farm leadership team to identify and select these individuals.

The second population included farmworkers. The survey instrument was based on a previously validated capabilities approach tool, translated into Spanish and distributed to all farmworkers for their voluntary participation (Lorgelly et al., 2015). The interviews employed purposive sampling to identify those farmworkers already nominated by their peers to serve on the fair trade committee. Document analysis included content from the digital records of the farm, Fair Trade USA, and other value chain actors involved in the study. Insights were triangulated from analysis of the data,

Semi-structured interviews were conducted, in English, with the first population to better understand how farm management and value chain stakeholders view Fair Trade USA and their observations as to how the new domestic model is being implemented at the farm. These interviews also elicited insights concerning value chain stakeholder perspectives on the dimensions of ethical consumerism. The interview questions further yielded insight into what motivates different value chain stakeholders to support the fair trade system through their business transactions. Interviews with institutional representatives from the farm, including management personnel and fair trade committee members, focused on the dynamics of how the certification has been implemented within the operational structure of the farm.

In addition to gathering basic demographic data, interviews consisted of four content areas: (1) demographics and general association with the farm, (2) perception of the fair trade certification program, (3) perception of the benefits of the program for farmworkers, (4) perception of the role of value chain actors in supporting certification. In the first content area, interviewee demographics and standard questions about residency, language, identity and the nature of and business history with the farm were asked. In the second area**,** interviewees were asked about how they and their institution view the certification program. In the third area, interviewees were asked about their perception of how they think the program benefits farmworkers. In the fourth content area, interviewees were asked about how they view their organization's role in the value chain, supporting the Fair Trade USA certification program. Per semi-structured interviewing methods, which emphasize an evolving series of questions, certain topics were explored in more detail, and questions were tailored to individual participant expertise, knowledge, and interest.

The second population consisted of farmworkers. To select workers for participation, maximum variation purposive sampling was used, which selects cases from different subgroups to examine variations in the manifestation of a phenomenon (Creswell, 2013; Patton, 2002). Participant selection strived to achieve diversity amongst respondent characteristics with relation to gender, age, education level, marital status, and time employed at the farm. This sampling provided variation in perspectives through recruiting participants with different demographic characteristics. When sampling challenges were encountered due to the COVID-19 pandemic, although the original research design included onsite recruitment and survey facilitation, new methods were integrated into the research process. The farm management had implemented the mobile communication tool GANAS, which allowed for the dissemination of updates via text message as well as polling and survey functionality. This system was deployed for the survey distribution on a voluntary basis. The

opportunity to participate in the survey was communicated in Spanish and English via text with a corresponding link three times over several months.

Data collected through surveying, in Spanish and English, focused on the capabilities theoretical framework and was intended to generate information on the impact of fair trade in employment, health, and community for farmworkers. The survey questions addressed the dynamics of farmworker roles and their perception of the impact of certification for their health, well-being, and livelihood sustainability. In addition to eliciting basic demographic data, the survey gathered information in three main areas: farmworker roles, worker personal/professional development, and worker livelihood and sustainability.

Data analysis was conducted separately, using qualitative and quantitative methods, on the semi-structured interview data, data gathered from document analysis, and survey data. Data was uploaded to Dedoose, a mixed-methods cloud-based research platform. The analysis approach for each method was selected based on the type of data generated. Data-driven coding was conducted for the semi-structured interviews to provide background and a broader context to perspectives of farmworkers on the fair trade committee and their survey responses. For the semi-structured interviews with committee farmworkers, interpretive analysis was conducted in order to more rigorously understand phenomena of interest through the perspectives of the farmworkers themselves. The visual and written data generated from document analysis was coded and informed both by a data-driven approach and by theory from the literature, including the capabilities concept, which focuses on agency, empowerment, and livelihood sustainability.

Three rounds of coding were conducted for the data generated. For the interviews, there was a first round of informal coding during the transcription and translation stage, conducted by the primary investigators. Formal digital coding was conducted on the text from interviews, and on the images and text from the documents. (In Dedoose, components of visual data can be coded using the same coding system as text; an entire photograph can be coded thematically, while subsections—images within the photograph—can also be coded.) Excerpts from the text and images of significance during coding were highlighted and tagged thematically, mainly data-driven but also informed by the major concepts from the interview guide. Once the initial round of coding was complete, the codes that emerged were reviewed, refined, and merged where necessary to account for gaps or redundancies. In some instances, more comprehensive codes were expanded to include subcategories. In other instances, codes that were very similar were merged to create larger categories, with the similar codes then becoming subcategories.

This process of iterative coding, followed by multiple rounds of code refining, has been categorized as open, axial, and selective coding, stages characteristic of qualitative analysis through which the relationship among codes is distilled, forging deeper understanding of the underlying patterns (Birks & Mills, 2015; Saldaña, 2016). When this process was complete, a coding scheme was created to describe the approach that the primary investigator took, based on the original analytic questions, literature reviews, and data-driven concepts that emerged through the original coding.

Results

Farmworker Survey

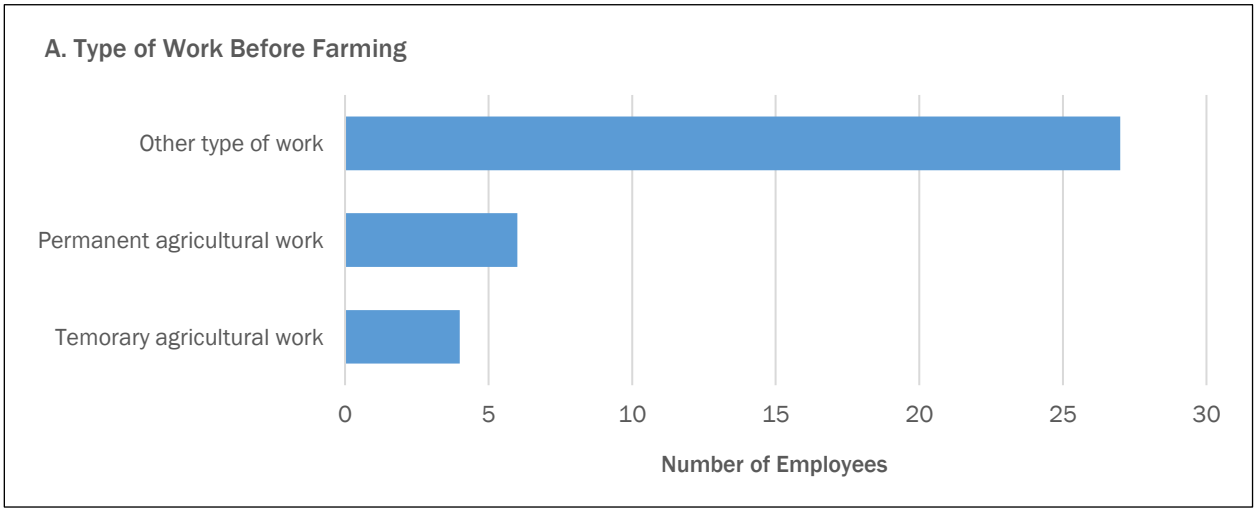
Thirty-seven farmworkers responded to the survey of 196 that were polled to voluntarily participate, an overall response rate of 19%. Multiple requests and follow-ups were attempted to achieve a higher response rate, but given the extreme challenges that many farm operators and farmworkers were facing during the pandemic period, this response rate has been sufficient to gain initial insights appropriate for this exploratory study. However, the sample size is a major limitation of the study. Nevertheless, the data provided an initial foundation for understanding farmworkers' perspectives about their work in general, and how the fair trade program has impacted their situations.

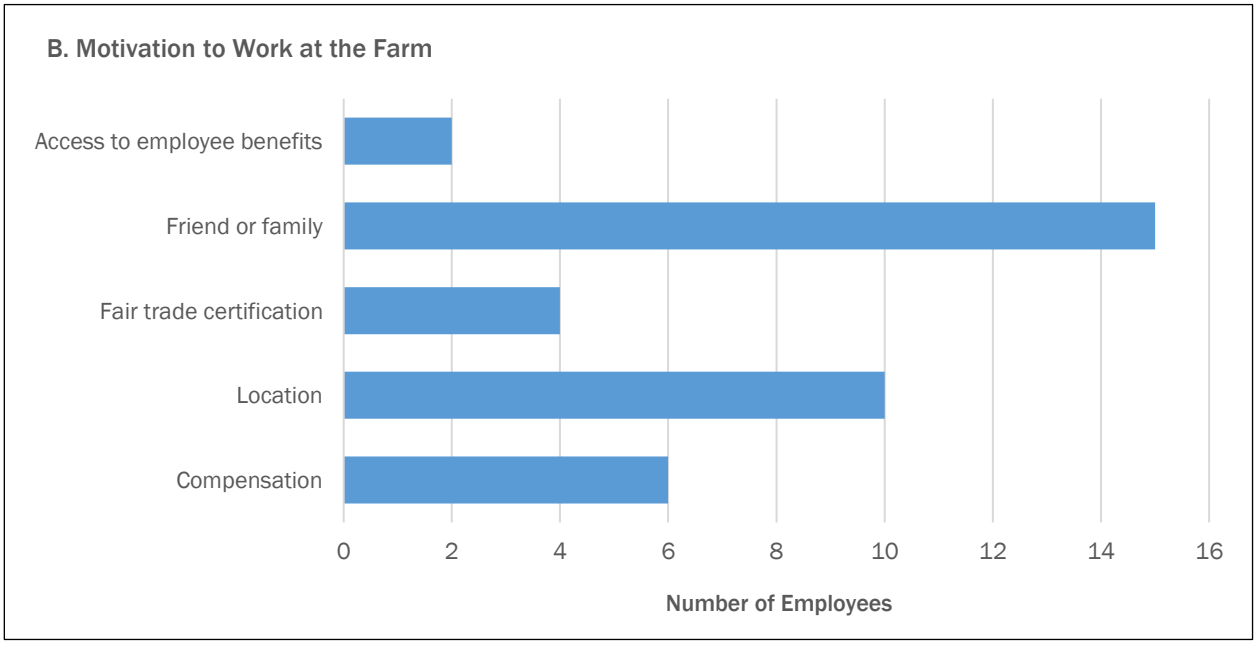
The first part of the survey sought to determine the employment backgrounds of farmworkers and what motivated them to join the farm. Before working on the farm, 75% of respondents were

involved in other types of work, and 25% were involved in either temporary or permanent agricultural jobs. Most respondents were motivated to join the farm because of the convenience of its location, and at the referral of family or friends. Figure 1 displays farmer responses to the initial background questions.

The second part of the survey explored the impact on farm employment related to benefits from the Fair Trade USA certification. In addition, this section sought to broadly understand the extent to which farmworkers connected certification to the benefits. The results demonstrate that while only 10% of respondents were motivated to join the farm due to the certification, 70% responded that certification made a difference in their livelihoods and in their well-being. Related to this observation was that almost 50% of respondents shared that they have benefitted most from the trainings offered through the farm, followed by the independence and respect they have gained as employees. Most respondents also stated that their

Figure 1. Farmworker Labor Background





income has become more stable. In addition, close to 80% stated that this improvement in their livelihood has made it easier to cover the costs associated with basic household necessities, healthcare, and transportation. Table 1 presents the breakdown of the responses related to perceived benefits and fair trade impact.

Interviews

The interviews were conducted with institutional representatives including farm management, supply chain stakeholders, and the fair trade committee composed of peer-nominated farmworker leaders. Sixteen interviews were conducted, ten with institutional representatives and six with the committee members. The institutional representatives included farm employees involved in administration and management, and personnel from supply chain companies associated with the farm. The interviews covered three distinct areas of inquiry: the history and dynamics of how the fair trade program was adopted and then implemented in the U.S., the specific impact of fair trade certification on the farm, focusing on farmworker well-being, and the role of the supply chain in supporting value chain sustainability, including an exploration of consumer perception. Table 2 provides an overview of the major results of the coding analysis.

Implementing Fair Trade in the U.S.

The first part of the interview process was focused on exploring the broader context and history related to the implementation of fair trade in the United States.

Origins of the Fair Trade Program in the U.S.

To better understand the origins of the domestic Fair Trade Program in the U.S., institutional representatives were asked about their perspectives on how the program evolved from the original international model through Fairtrade International. They were also probed to consider the contextual role of the program in U.S. agriculture. One farm manager reflected on the history of fair trade and why a new approach was required to address U.S. agriculture needs:

> More traditional fair trade was based on smallholders and cooperatives [sic] in Central and South America, farmers with a few acres of coffee bushes, and that was the focus and how

Table 1. Farmworker Responses on Livelihood Sustainability

Main Benefit of Farm Employment	Percentage (%)		
Friendship	3		
Independence	10		
Respect	22		
Confidence	16		
Training or Occupational Knowledge	49		
Categorical Improvement (Y/N)	**Yes (%)**	**No (%)**	**Uncertain (%)**
Overall Income Improvement	70	11	19
Benefit from Fair Trade Premium	76	13	11
Improvement in Household Financial Security	81	3	13
Improvement in Healthcare Access	76	11	13
Improvement in Transportation Access	78	8	14

Table 2. Coding Scheme

Major Categories and Subcategories	Themes
Implementing Fair Trade in the U.S.	• Historical origins • Need to reform large U.S. farms • U.S. farmworker rights • Business benefits
Farmworker Benefits	• Community development through projects • Farmworker voice • Empowerment
Support Through the Value Chain	• Risk management • Rising awareness in the supply chain • Consumer purchasing power

> it started. If you look at who is working in ag and who is doing the labor in the U.S., that model does not fit. The majority of farmworkers work for a farmer, so the model for the U.S. had to evolve to be able to bring these key stakeholders into the conversation. (P5)

Most farm staff interviewed claimed that adoption of the fair trade model in the U.S. was a natural evolution of the business, which straddled the U.S.–Mexico border with farm operations on both sides. Becoming the first Fair Trade USA-certified farm in the U.S. was deemed a natural extension of the farm management team's approach on their farms in Mexico. However, most interview participants noted significant differences in needs between farmworkers in Mexico and farmworkers in the U.S. One farm manager shared:

> Domestic fair trade was a real different beast than what we had established in Mexico, and everything in fair trade starts with a needs assessment. The needs that were outlined here really surprised us. We were expecting what we saw in Mexico, a need for education and transportation and a lot of these basic services that we didn't realize we pretty much have in the U.S. But the workers needs were others and they really pointed out to us what they needed. Hey, healthcare is really expensive, can you help us with fair trade to offset some of those costs for us and our families. I brought this up with our group, hey, this is really different. They are not looking for a school, they are looking for the help to get through some of these high cost parts of living in the U.S., and healthcare is obviously a huge part of this. That was one of our first experiences working with domestic fair trade. We also have a farm in California, and their needs are even different than here in Arizona. They are looking at things like housing, which is so expensive in California. The idea that they can own their home is like a pipedream. So that group has been pooling their funds over several years to buy land to purchase where they can build their own houses. (P10)

Another theme that emerged from interviews with institutional stakeholders was the need for a fair trade system on large farms, a need inherently tied to the benefits of the Fair Trade USA system for farmworkers. A human resources representative from the farm shared their perspective on why fair trade is just as important for large farms:

> I will give you an example of why a large farm needs this as much as a small farm. Our very first farm to be certified was in Sinaloa, and the second was in Sonora. We now have nine green houses in Sonora and it's one of our largest employers because they ship year round, they have the benefit of accumulating premiums over the whole year. They were just starting fair trade eight years ago, and one of our first initiatives was the scholarship program. It started very simple, if we can help parents getting school supplies and shoes and uniforms, then their kids will go to school. That added in a transportation component, and that has helped this community flourish in an incredible way. We had students barely going to high school, and now we have students going to college, and a masters student on fair trade scholarship. We help them with housing, with books, with living expenses, all through air trade scholarship program. It has created now a generation of children of farmworkers who are university graduates. And that is amazing to see. In just eight years, to see this turnaround from kids barely going to high school to now having university degrees and becoming teachers and engineers. We have one kid who came back who now runs the library. Just because we were a large farm didn't mean that we didn't need the extra help to propel these families forward. (P1)

In addition to sharing perspectives on the importance of the Fair Trade USA certification for large farms, a variety of supply chain stakeholders advocated for the need to focus on farmworker rights and working conditions, which many considered to be minimized in the U. S. One farm manager observed:

> I think the U.S. gets a pass when it comes to thinking that everything here is perfect and great and farmworkers live the life, but there are still a lot of inconsistencies in how farmworkers are treated in terms of safety practices, what is available to them to in terms of a system to air grievances. It might not look like poverty, but it definitely looks like a group of workers who could definitely be taken advantage of very easily, most of them being grievances. There is a little bit of an immigrant mentality: if things are going wrong, you don't say much because you don't want to rock the boat. I think our generation is trying to break that: and this is where we want to say if something isn't right then it isn't right. That's where Fair Trade USA's domestic program has come in and say look, we do work in the U.S., and there are a lot of laws that we do need to abide by, but this is going the extra mile to prove to our consumers that just because we grow in the US doesn't mean these laws and practices are perfect and we are trying to go beyond that to give a better life to these farmworkers. (P1)

These observations point to the tenuous environment and circumstance in which farmworkers continue to labor, and the opportunity for the Fair Trade USA system to provide enhanced protection, security, and transparency.

Business Benefits

An unanticipated set of benefits for obtaining Fair Trade USA certification was shared by farm management, who stated that the system did not just benefit farmworkers, but also overall enhanced the sustainability of their business. They stated that the system did this in two ways, which both aid in farmworker retention: building a culture of empowerment through the development of agency and leadership, and opening access to material benefits,. One sales manager shared:

> The biggest benefit for the farm is to make the sale and how it reinforces the culture in the company. I see the farm as a vehicle for people to improve themselves. And that we are part of creating agriculture in a different way. It is very rewarding to see these [fair trade] projects come to light. … The fair trade program does that: it engages people in a different way. It does give meaning to the work that we are doing. (P5)

A human resources manager emphasized this theme, and discussed how the fair trade program enhanced material benefits for employees, improving retention for the farm business:

> Another benefit to employers to being fair trade-certified is retention rate improvement. Employees do understand how fair trade works and what the standards are, and when we are audited, they will interview employees. They understand that this is a pretty good place to work with a lot of great benefits if they want to take advantage of those. It really helps with our retention rates. As far as other benefits, I think knowing that FT standards are fairly tight on employers for safety. Some farms just don't care about safety. That was one of the first things I did was implement an OSHA certification program, which is part of the fair trade program as well. We have done that not just in Arizona but in Mexico as well. Now our sites are having a friendly competition to see which can be the safest. Work rules, schedules, overtime, pay practices, those are all benefits for the workers. The terms and conditions of employment overall are much better. (P3)

In addition to the more standard employment benefits, the fair trade social premium was noted as a mechanism for not just giving back to the farmworker community, but providing them with a tool for improving their lives. Another human resources manager commented:

> Fair trade is important because farmworkers matter and they deserve to benefit from a program like this. It is a super important program for them because they are working hard, so it is like a compensation for them to be a part of the something big. It impacts their lives, and it impacts their families. It also impacts the com-

> munity as well. It is something very important for our farm labor, and we work hard to make sure the impact spreads. It makes their job important as well, because they know the premium will come back to them as a team. (P4)

While material benefits may have been a more obvious indication to farm management of how the fair trade system could improve farm operations through worker safety and more rigorous labor standards on the operations side, equally, and perhaps more important, has been the creation of culture and infrastructure to support the development of farmworkers' individual agency and collective empowerment through shared governance and mechanisms for community improvement via the fair trade premium.

Farmworker Benefits

Farm management and the fair trade committee observed several forms of farmworker benefits: access to healthcare and health insurance, housing, transportation, community infrastructure, and farmworker-initiated voice and collective empowerment. Primarily, material benefits of health, housing, transportation, and community were at the forefront of what both farm managers and the committee discussed when they reflected on the benefits of fair trade certification.

Healthcare and access to health insurance is a complex issue for farmworkers, depending on their immigration and employment status. Most farmworkers would prefer to access healthcare in Mexico in a familiar system that is much less costly. When the American Care Act (ACA) was first implemented, it carried a requirement that incentivized farmworkers to carry health insurance. With the downgrading of the requirement, enrollment has not reached previous levels, but is still higher than before ACA. A fair trade committee member discussed how the fair trade program has contributed to supporting health insurance and healthcare costs:

> As a worker, here in the U.S., we have access to healthcare, which I pay for as an individual and I have the biggest plan. For this plan I pay for 20% of the total cost, fair trade pays for another 20% of the total cost, and the company pays for the remaining 60%. It's a huge help that the company provides for us, as well as the fair trade committee, such that we only have to pay 20% of our health insurance costs. In this moment I'm talking to you as a farmworker, not as part of the committee, right? So, paying only 20% of health insurance costs is super economical. I have access to dental care, vision care, and whatever happens to me, well I have a general health insurance too. And this is a benefit that extends to the entire family! (P2)

Another committee member described several housing and transportation projects that have benefitted farmworkers. Due to the rural location of the farm and the dispersed housing of farmworkers, reliable and affordable transportation was a significant need. Representatives from farm management and fair trade committee members discussed how the fair trade premium has been used to support improved transportation for farmworkers, recognizing the benefits for farm operations as well as for workers . A committee member stated:

> One project is home improvement. Almost 100 employees have benefited with that project, where they get $1000. You have to meet the needs and the requirements to qualify for the project, but it is amazing to see the before and after pictures of the home improvements. The other project is transportation. The farm is 20–30 miles away from Nogales and Tucson, and so instead of struggling to get to work they contract with a. transportation service that brings them to work and takes them back home. They pay less for gas and can put that towards grocery shopping. The shuttles transport them back and forth. (P14)

Another committee member said about the transportation project:

> An economic benefit that I have witnessed for farmworkers at large, which was in place before I joined the committee. This was the transport project. The majority of people who

> work here live in Mexico or closer to Tucson, so in order to save on transportation costs to Amado we started a shuttle. The fair trade committee pays for half of the costs, and the company covers the rest. (P3)

A broader area of improvement was the community projects supported through the fair trade premium. As with cooperatives outside the U.S., in the U.S. a peer-nominated fair trade committee leads a group in voting on community projects to pursue. Committee members described different health-sensitive projects that the group has collectively implemented, addressing needs related to housing, exercise infrastructure, and food security. A farm institutional representative summarized the variety of projects supported through the premiums:

> The farmworkers choose what kinds of project they want, and many of them benefit the community at large. The soccer field, for example, brought the whole community together around the field: kids use it, adults use it, and it creates community. There is also a push now to support bigger projects like help with home improvements and home ownership. This would be huge, as home ownership creates a real sense of security. The group in Imuris created a food cooperative, kind of like a 'Walmart-cito' [small Walmart], and we have discussed this as well, to provide people with easier access to basic necessities, especially fresh foods. (P5)

In addition to the material benefits that the fair trade program has provided, both farm management and the fair trade committee described the powerful impact that the program has had for the development of agency and empowerment. While farmworker agency and empowerment were discussed in terms of how they have improved business through worker retention, many respondents from management and the farmworker community also described the critical role the standard plays in amplifying the collective farmworker voice through the governance structure of the committee. One farm manger said:

> Farmworker voice is another big benefit of the fair trade system. You have to really make an effort to listen, and fair trade creates the infrastructure for that. Having a formal process that engages people: I am not saying it's perfect, but it's a step in the right direction. … The general manager of the farm was like: you don't live here—everything you are saying is fine but that is top down. You don't see the value because you don't live here. You are not here everyday. … It was a humbling experience. … No one knows what is better for them than the people that are there, and that understanding was like a lightbulb that went off in my head. When I say worker voice is hard to hear—it takes time for them to have buy in to the fair trade system, but when they do they just go go go. So their priorities are primary. It's a huge benefit that doesn't exist up front in the fair trade system. (P5)

Another farm manager affirmed the critical role of shared governance through the committee structure in creating a culture of empowerment amongst the farmworkers:

> Empowerment is huge. They are empowered, they speak fair trade. Especially the fair trade committee, they have been learning different skills, and the whole group takes ownership and speak the fair trade language. It is just awesome to see that they are empowered. They have the right to vote, when they have the general assembly, they are asking questions, they are engaged. This has changed them for sure. There was this one employee that left the company to pursue a better opportunity but came back because they missed being a fair trade member. So that is tremendous, and they are empowered for sure. (P6)

The farm management and fair trade committee sentiments affirmed individual and collective empowerment, established through the transparency and collective decision-making of the assembly of farmworkers gathered under the leadership of the fair trade committee. One committee member observed:

> The funds that we have from the committee belong to everyone in the end, right? Not just the committee, but the assembly in general. We are the ones that administrate, but we make the decisions together and we are very transparent at all times. (P12)

The interviews demonstrated that Fair Trade USA has created space and structure within the farm business to focus on the material well-being of farmworkers, particularly essential necessities such as healthcare and transportation. The governance structure of the committee has created an avenue for the collective farmworker voice and a mechanism for farmworkers to develop leadership skills.

Support Along the Value Chain

The third major theme that emerged from the interviews process was the importance of the value chain in providing support for fair trade by creating market demand, particularly at the retail and consumer level. At the retail level, motivations for purchasing fair trade were described as having started to address risk mitigation. The motivations have evolved to embrace the fair trade system. A farm manager commented on the pivotal role that supply chain wholesalers and retailers play in purchasing and providing access and education for fair trade on the shelf.

> There is also the supply chain itself. The more knowledge the supply chain has, the better they understand it, the more access they give to the consumers. We can produce all the tomatoes we want, but if the Walmarts of the world are not willing to put it on their shelves, it won't be there for consumers. So it's really a key component of the success is how we can access the market which comes from retailers that are the ones that have the shelf space. (P2)

Another manager reflected that many retail buyers first purchase fair trade for risk mitigation purposes, but that they are starting to see less defensive and more offensive purchasing decisions:

> There are people that also do it because of risk mitigation. [Retailers] understand that they don't want to appear irresponsible. They want to have a responsible supply chain. So, it's a risk mitigation strategy to work with fair trade certified-farms. There was an LA times articles criticizing Mexican farms for bad labor practices and it was a watershed moment in our industry. I think that fair trade certification will have the same arc as organic. That was the responsible choice then, this is the responsible choice now. If you build it, they will come. There are some wholesalers and retailers that are still so price driven, I can't change their minds. But I can choose who is most strategic to me as a buyer. I have seen great strides. We are about to embark on a pilot with Fair Trade USA at Walmart. They are committing to a two-year pilot project on fair trade-certified tomatoes from Mexico. We are one of the smaller ones participating. But that brings me a lot of hope. You think Walmart and its everyday low prices and price driven. But to me that is very exciting to see a pilot like that with a company with such a big reach, to bring this message to consumers. They see the logo, and they know it's good and responsible. They might not really understand it, but 65% recognize the logo. A partner like Walmart can bring a lot of people to that message. I brought some buyers from west Texas, I am talking as right of right, red of red, to the farm. Showed them the farm, they loved it. They loved the fair trade project. They don't buy a lot, but everything they buy is fair trade. They see that this is not socialism, that we are making a product and taking it to market and being competitive. This is not a handout, and they got it right away. To me, those are very encouraging signs for sure. (P5)

Consistent with this sentiment, another farm manager expressed optimism about the shift they are seeing in retail to support fair trade:

> I think awareness is catching on more in the wholesale and retail space because you take Costco, Walmart, Whole Foods, I mean, they are just 100% committed. We would have community projects (like a school kitchen),

> and we had Whole Foods volunteers to come and help. So, they are in completely. And Costco, Walmart. We make sure our external growers in Mexico and California are all fair trade certified. We require it because our customers require it. That is where it is really catching on. Getting the products out in front of the consumers so that they have options: how do they want to spend their money. (P3)

Addressing the consumer end, farm management discussed the trends they have seen over time and how consumers may perceive and then support the certification. One farm manager stated:

> I think at the end of the day we all want to make a difference, right. I think consumers respond to a fair trade message because we want our purchase to matter. Consumers respond to the fair trade message because we want to believe that the companies we support, support the values we support. Price is important, but it has been proven its not necessarily the lower price that gets you the sale. People want to be invited to be a part of the solution. One way is to show them how their purchases have an effect. The average consumer does not understand between rainforest and FLO and Utz, that is too much minutia, it is clear that you still have to have great quality, good product, but if you can invite me to be responsible, I am rewarding that. There will never be a short cut. Our produce needs to be awesome, look great, taste great. We can never sell crappy fair trade-certified tomatoes. We still need to get all that right. But if we can give the invitation to make the responsible choice, consumers will reward you. (P5)

Another manager said that they have seen consumer perspectives changing, and noted the role that consumers believe they have through their purchasing power:

> I think there is some information that consumers have but they can't get the full picture. They understand it is something good, and that they are taking care of the people who produce the products, whether its tea, or a tomato, or furniture. Maybe they don't get the full understand of what it is, but they believe they are voting with their dollars for something that is made correctly. That provides opportunities. I don't think they understand how the premium works, but they think it is something that is responsible. Responsible has resonated with consumers: how we treat people, how we treat the environment. With the pandemic, it becomes even more relevant. That we understand how fragile how we live is. So taking care of others becomes even more important. That is how the consumer relates to fair trade. That is my take on it. (P2)

These remarks demonstrate the key role that the supply chain plays in supporting the fair trade movement by purchasing fair trade products, from the retailer and consumer sides.

Discussion

The exploratory results from this research describe the impact of implementation of Fair Trade USA certification on the first U.S. certified farm, grounded in the perspectives of farmworkers, fair trade committee members, and key stakeholders at the farm and within the farm's supply chain. The data shows that implementation has resulted in multiple levels of benefit at the farm level. Perhaps most importantly, these results shed light on how the organizational structure of the fair trade committee and the assembly of farmworkers provides a safety net of support and a source of individual and collective empowerment. Through the opportunities supported by the fair trade premium, farmworkers acquired ability to enhance the stability of their health and livelihoods.

Two major themes characterize the dynamics of implementing the Fair Trade USA certification. The first, at the individual level, involves the important role of the unique institutional arrangement created through certification the fair trade program not only improves labor standards when compared to the basic OSHA requirements, but the social premium provides an additional benefit that supports farmworker access to health insurance, safe and secure housing, food access, trans-

portation, and community infrastructure for socialization and physical activity. At the collective level, the farmworker-elected fair trade committee represents an important innovation for the farm labor landscape, serving several essential functions. As a leadership and governance structure for farmworkers, the committee guides collective decision-making about the fair trade premium funds. The committee helps steer this process, while providing training and professional development opportunities for committee members. In addition to serving a unique role in supporting internal organizing of farmworkers, the committee also serves as a leadership body to be consulted by farm management. As such, the committee provides workers with a direct communication channel to farm leadership.

In sum, the many benefits provided to farmworkers by implementation of Fair Trade USA standards begin close to the farmworker and further develop downstream into efficiencies and value for farm management, farms, produce retailers, and ultimately the consumers of Fair Trade USA-certified products. Although additional research is needed, the first U.S. fair trade certified-farm offers evidence of the impact of farmworker governance at the farm level, promoting improvements for farmworker health and well-being.

While the integration of Fair Trade USA certification into the agricultural landscape offers more equitable and sustainable agricultural practices, there are challenges and barriers to consider. The most salient challenge is that the system is voluntary, and therefore relies on early adopters and forward thinking innovators whose values and market orientation align with the fair trade movement. Until there are state or federal requirements and/or incentives to adopt this type of certification, fully scaling the benefits will rely on a combination of early adopters and the pressure of consumer and supply chain demand. Acquiring certification requires buy-in from the farm management, and the administrative resources to comply with the rigorous paperwork, auditing, and implementation process. For value chain supporters, the added cost of purchasing fair trade-certified products remains the main barrier, in addition to supply issues. In many instances, farms certified by Fair Trade USA are still in the process of scaling up to meet such demand for larger retailers that want to commit to fair trade purchasing.

Limitations

The limitations of this research are primarily related to the study design, language, and the respondent selection process. As with all research, the positionality of the primary investigator and the interviewers, has had an unavoidable influence on relationships with study participants and community members. Respondents may have felt pressure due to loyalty to positively portray the institutions by which they are employed, which should also be considered when considering the data. These limitations were addressed through data triangulation, which included multiple avenues of data generation and analysis. Challenges with language may have also been a challenge as the research with farmworkers and fair trade committee members was primarily conducted in Spanish, and the data translated into English for analysis. The relatively small sample size also has clearly limited the depth of understanding.

Conclusion

The purpose of this paper has been to explore the dynamics of implementing the Fair Trade USA certification through the perspectives of farm managers and farmworkers on the first certified farm in the U.S. Farmworker survey results were triangulated with the perspectives of farm managers and farmworkers from the fair trade committee to better understand implementation and benefits that may stem from the program. These findings have highlighted ways in which the Fair Trade USA program has benefited farm operations, improved farmworker access to key necessities, and created the space and organizational structure for farmworker voice and empowerment through the fair trade committee. These findings demonstrate that certification has been able to provide significant worker benefits of healthcare, housing, transportation, and community development that have otherwise been difficult or impossible to access for farmworkers. In addition, the research demonstrates the importance of the coordinated role across the value chain in supporting fair trade, from the retail to consumer levels. Although

initially motivated by risk mitigation, as business practices have shifted to embrace the importance of leadership in environmental and social governance more corporate behemoths have begun to integrate certification requirements into their purchasing practices. In addition, growing consumer desire for production transparency and values-based purchasing has increased demand for products with certifications like fair trade. The research contributes to a better understanding of the dynamics of implementing fair trade in the U.S., and the benefits that the program has created for farm operations, farmworker well-being, and improvements in the value chain around social and environmental impact.

Understanding the dynamics of how the Fair Trade USA program has been adapted and tailored can inform the success of programs and policies aimed at supporting broad program diffusion. However, further research is necessary to establish more robust evaluations of the longer-term impact of Fair Trade USA. Based on the future potential for success of this program, it is possible that the standards of Fair Trade USA could be operationalized at the state and then federal government level, following the same pathway as the USDA organic certification program. This type of approach could lead to substantial improvements in farm management, farmworker well-being, and value chain sustainability.

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Using TAPE to assess agroecology on women-led farms in the U.S.: Support for environmental and social practices

Lianna Gomori-Ruben [a] * and Chantal D. Reid [b]
Duke University

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Abstract

Agriculture models predicated upon producing monocultures for export have proven unsustainable. In response, the Food and Agriculture Organization of the United Nations (FAO) has called for nations to produce food agroecologically in alignment with natural ecosystems. The FAO identified women as critical yet underrepresented leaders in agroecology projects worldwide. Prior research about agroecology and women farmers has primarily been situated in low-income nations. This study examines women farming in the United States as a high-income nation to analyze if their practices align with agroecology using the FAO's 10 Elements of Agroecology and the FAO's Tool for Agroecology Performance Evaluation (TAPE). A mixed-methods case study design was used to collect web-based survey and interview data from 87 participants. We found that the participating women farmers tended to lead agroecological farming projects that provide direct nutritional, environmental, educational, and social services to their communities in alignment with elements of agroecology. Ninety percent of participants operated farms at 100 acres (405 hectares) or less that mostly used direct sales models (farmers markets, community supported agriculture operations [CSAs], farm stands, and online sales), and half of participants offered opportunities for intergenerational engagement. These practices align with the FAO's elements of Diversity, Co-creation and

[a] * *Corresponding author:* Lianna Gomori-Ruben, Master's student, Duke University Nicholas School of the Environment; Durham, NC, USA.

Lianna is now an independent consultant. She can be contacted at +1-917-225-8340; lianna.g.ruben@gmail.com

[b] Dr. Chantal D. Reid, Professor Emeritus, Duke University Nicholas School of the Environment; 9 Circuit Drive; Durham, NC 27710 USA; chantal@duke.edu

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Sharing of Knowledge, Resilience, Human and Social Values, Culture and Food Traditions, and a Circular and Solidarity Economy. Environmentally, participants emphasized using practices for crop diversity, building soil health, and integrating animals in alignment with the FAO elements of Diversity, Synergies, Recycling, and Resilience. Farm size and region were significant in the prevalence of agroecological practices. Farms of 50–100 acres (202–405 hectares) were most likely to integrate animals, and farms in the Southeast were most likely to identify with conventional agricultural practices. Our data show that women-led farms in the U.S. align with sustainable agricultural practices as articulated by the FAO and, as in low-income nations, women play a valuable role in advancing a national agroecological transition.

Keywords
agroecology, community building, farm size, farm management, FAO, agroecology elements, women farmers, mixed-methods case study, resilience, sustainable agriculture

Introduction

The food system is dominated by conventional rather than sustainable practices. Building the food system upon conventional industrial agriculture that puts profitability and productivity at the center has proven to be a significant driver of the current climate crisis. The practices used are environmentally unsustainable, fueling deforestation, soil erosion, and water consumption, while failing to adequately nourish the global population (Altieri et al., 2012; FAO, 2018; Gliessman, 2015; Montgomery, 2007; Willett et al., 2019). Alternatively, agroecology is an approach to produce food equitably and environmentally sustainably by centering environmental health, economic viability, social equity, and the political power to decide the food that is produced and consumed within one's community (Altieri, 1988; Anderson et al., 2020; FAO, 2022b; IPES-Food, 2018; Gliessman, 2015; González De Molina & Lopez-Garcia, 2021; Holt-Gimenez & Altieri, 2013). To foster transitions toward equity and sustainability, the United Nations Food and Agriculture Organization (FAO) works to apply the United Nations' Sustainable Development Goals to food systems through agroecology.[1]

Agroecology today is defined as a holistic applied science that situates agriculture within ecological and socioeconomic systems and a context of justice and human rights to develop sustainable food systems (Altieri, 1988; FAO, 2022b; Gliessman, 2015; Holt-Gimenez & Altieri, 2013). The term has evolved since its initial usage in scientific literature to describe the application of ecological principles to agriculture for commercial crop production (Bensin, 1928, 1930). During the environmental movements of the 1960s and 1970s, the concept of agroecology expanded to incorporate opposition to industrial agriculture (FAO, 2019; Lutzenberger, 1976; Wezel et al., 2009). In the 1980s, agroecology was defined as an applied science focused on protecting natural resources and developing sustainable agroecosystems (Altieri, 1989; Gliessman, 1997; Wezel et al., 2009). It has since expanded to include eliminating exploitation and measuring success through food sovereignty, food security, and ecological and human health (Anderson et al., 2020; Zaremba et al., 2021).

Worldwide, women have been identified as leaders of agroecology projects, so understanding their roles in food systems is critical (FAO, 2022a). Women tend to lead decision-making around food acquisition, preparation, and consumption in their households (Anderson et al., 2020). Despite performing agricultural labor at the same rate as men, women are underrepresented in—and often marginalized from—land ownership and political power. An agroecology model that achieves gender equality would apply feminist economics to conceptualize value in care provision and reproductive work along with productivity and profit (Di Masso et al., 2022). Care provision and reproductive work, in this sense, encompass the long-term life-cycle maintenance of living ecosystems (Di Masso et al., 2022). The FAO's agroecology initiatives seek to empower women in food systems by expanding their access to economic opportunity and their capacity to collectively organize (FAO, 2018). Previous research about agroecology and women has

[1] Agroecology works toward achieving Sustainable Development Goals 1–6, 8, and 10–17 (FAO, 2022c).

been concentrated in low-income nations by emphasizing the economic benefits that would be realized through increasing women's empowerment (Anderson et al., 2020; Bezner Kerr et al., 2019; Paz Hidalgo, 2020; Trevilla Espinal et al., 2021). High-income nations are often sites of gender inequality as well with unrealized economic potential. A recent study of gender equality in 149 nations ranked the U.S. 51st (World Economic Forum, 2021). The purpose of this case study is to include the U.S. in the FAO's work as a high-income nation that is a site of gender inequality and to evaluate whether and how the U.S. may also stand to benefit economically, environmentally, and nutritionally from the equal empowerment of women in farming. We examined women farming in the U.S. by assessing their agricultural practices for alignment with agroecology. We used the FAO agroecology assessment tools to develop internet surveys and phone interviews.

Women Farming in the United States

The U. S. Department of Agriculture (USDA) has collected national farm data every five years since 1840 through the Census of Agriculture, but long-term data on farmers by sex is lacking. The term "farmer" was initially defined as the sole or primary operator of a farm, and only one farmer could be listed per farm. Men were typically listed as the farmers on record despite often farming alongside women in farm family structures, which is illustrative of a history of heteropatriarchy both within the U.S. and in farming (Hoffelmeyer et al., 2023). The first census to classify farmers by sex was in 1978, and women represented 5.2% of farmers on record (Kalbacher, 1985). By 1997, the number of women farmers reached 9%, a near doubling (Hoppe & Korb, 2013). Since then, further changes in the census classifications and definitions have allowed for better documentation of women's leadership on farms. In 2002, the census changed the farmer category to allow up to three farm operators and one principal farm operator, the distinction being that farm operators were in charge of daily decision-making and the principal farm operator was additionally charged with census data collection (Pilgeram et al., 2020). In 2017, the census changed to allow the indication of up to four farm operators, of whom zero to four could be indicated as principal farm operators as well (Pilgeram et al., 2020). As of 2017, 56% of farms had at least one female farm operator, and 36% of all principal farm operators were women (USDA NASS, 2019). While the growth in the number of registered female farmers is largely related to changes in census methodology, the number of women farmers on record as decision-makers is higher than ever before (White & King, 2019). Calls to refine the census methodology continue today to capture the spectrum of farmers' genders and sexualities. A study by Dentzman et al. (2021) determined that queer farmers make different management decisions than their non-queer counterparts. While this study is focused on the practices of women farmers, sexuality and intersectionality are important factors that affect farm management and complicate conclusions about women as a group.

Census data indicate that female farmers tend to make different management decisions than male farmers. In 1978, women farmed on smaller plots of land, averaging 235 acres (95 hectares) compared to men's 423 acres (171 hectares), and they generated less income, with an average of US$16,000 compared to men's US$26,000. Women also owned their farms at higher rates (79%) than men (58%), carried debt at lower rates (37%) than men (58%), and averaged less debt (US$45,000) than men (US$84,000; Kalbacher, 1985). The 2002 and 2007 censuses showed that women were more likely to operate small, diversified farms and to certify as organic than men, and men were more likely than women to produce commodity crops such as corn, grain, soybeans, oilseed, hogs, and beef cattle (Barbercheck et al., 2014; USDA NASS, 2002; 2007). As of 2017, the average female-operated farm generated US$28,259 compared to the national average of US$43,053 (USDA NASS, 2017).

Women-led farms show trends in location choices, sales models, and service offerings. In an analysis of census data, Schmidt et al. (2021) found that women tended to farm on smaller farms in urbanized areas with higher population densities rather than larger farms in remote rural areas. Women were more likely than men to farm in areas with higher income levels, greater childcare access,

and more equitable income distribution (Inwood & Stengel, 2020; Schmidt et al., 2021). In comparison to their male counterparts, women farmers were more likely to use direct marketing models to sell their products (Ahearn et al., 2018; Fremstad & Paul, 2020) and to farm using organic rather than conventional methods (Fremstad & Paul, 2020). They tend to utilize shorter supply chains and incorporate agritourism and other social programs (Schmidt et al., 2021).

Women approach farming through different social values than men, which affect their management decisions. For example, an Iowa study explored why the majority of community supported agriculture (CSA) arrangements were operated by women farmers and found that the participating women chose the CSA model because it incorporated their values of caring for the community and the environment better than conventional agriculture models (Wells & Gradwell, 2001). A study of women farmers in Pennsylvania found that the participants defined success in terms of profit, productivity, and service provision to the community (Trauger, 2004), and another study found that women identify social needs in the community that they then monetize (Trauger et al., 2009). Lastly, women farmers are more likely to engage in social networks for information sharing and to implement conservation practices if they understand how the practices align with their long-term goals (Bregendahl & Hoffman, 2010).

Comparisons of farm management decisions made by women against those of men suggest that the farming landscape may shift as women's representation in farm leadership increases. However, research on women's farming practices is limited globally, particularly in high-income countries including the U.S. (Ball, 2020; Schmidt et al., 2021). Given the few studies reporting on women farmers in the U.S. coupled with evidence of agroecology practiced by women in Latin America and Africa, this study seeks to address the following questions: what are the practices and approaches of women farmers throughout the U.S., and how do those practices align with the FAO's frameworks of agroecology? By assessing the landscape of American women-led agriculture, this study seeks to illustrate how sustainable food systems could be developed broadly in the U.S. as part of a global agroecological transition in relation to the UN Sustainable Development Goals and what role women farmers can play in that transition.

Materials and Methods

Study Design and Materials

This study utilized a mixed-methods case-study design to combine data from a web-based survey and semi-structured interviews to provide complementary data for interpretation and analysis (Creswell & Plano Clarke, 2018). Case-study research focuses on the complexity of a single case as a bounded system to identify a phenomenon of interest (Stake, 1995). This case study was bounded to focus on women farming in the U.S. within a period of four months from October 2020 to January 2021. Quantitative data from the web-based survey were used to identify trends across women nationwide, while qualitative data from the semi-structured interviews were used to gain an in-depth understanding of the experience of a small subset of women in agriculture leadership roles. A triangulation design and a convergence model were used to compare and contrast the quantitative and qualitative data concurrently to develop themes for interpretation (Creswell et al., 2003; Creswell & Plano Clark, 2018). Due to the case-study approach and the sampling methods, this research is exploratory in nature, as the women selected to participate are not a large representative sample of all women farmers in the U.S.

Questions for data collection were developed using the Tool for Agroecology Performance Evaluation (TAPE; FAO, 2019) based on the FAO's 10 Elements of Agroecology (FAO, 2018). The survey items and interview questions are adapted from the TAPE's Step 1: Characterization of Agroecological Transitions (CAET), which addresses the Elements of Agroecology (Diversity, Synergies, Efficiency, Recycling, Resilience, Culture and Food Traditions, Co-creation and Sharing of Knowledge, Circular and Solidarity Economy, Human and Social Values, and Responsible Governance) and Step 2: Core Criteria of Performance (Mottet at al., 2020). The CAET provides an objective tool to assess farmers' progress toward agroe-

cology. The survey and the interview guide were structured according to the TAPE's five key dimensions of Economy, Environment, Health and Nutrition, Society and Culture, and Governance. The survey was created and distributed through Qualtrics survey design software, with 82 questions that included multiple choice, Likert-scale, and open-ended freeform. The interview guide consisted of 17 open-ended questions to capture data parallel to the web survey.

The evaluation rubrics of the CAET were developed mostly in the context of low-income nations and include the role of women. Because our survey was centered on women in the U.S., we adapted some items and indicators. Table 1 shows the TAPE's original dimensions and core criteria of performance and the modified indicators that we used in this study. We chose to exclude diet and nutrition indicators from the Culture and Food Traditions element. The TAPE's focus in this section is to measure dietary diversity for women as a proxy for the nutrition of their households, while this research is focused on women as farmers rather than household nutrition providers. We chose to exclude the women's empowerment section from the Human and Social Values element because the TAPE's focus is to measure women's levels of agency and inclusion within broader agricultural systems, while this research is focused on women's management choices within their own operations. We added an elder empowerment index that mimics the youth empowerment index because we viewed the inclusion of this segment of the population as important to the Society and Culture dimension in the U.S. We adapted the Governance element to be based on women's knowledge of, and participation in, government programs, which differed from the TAPE items seeking to capture the acceptance and participation of women on farms in government programs.

Participant Selection and Data Collection

Fourteen professional food and farming networks from regions throughout the U.S. were contacted to distribute the survey through their social media or listserv outlets. The surveys were distributed

Table 1. Framework Organizing Dimensions, Elements, and Indicators to Assess Participants' Alignment with Agroecology

Dimension	Agroecology Elements	Original Criteria of Performance	Indicators Adapted for Use in This Study
Economy	Diversity Recycling Resilience Circular and Solidarity Economy	Productivity Income Value added	Products, business models, land access, income sources, consumer relationships, success metrics
Environment	Diversity Synergies Efficiency Recycling Resilience	Agricultural biodiversity Soil health	Crop biodiversity, animal integration, soil management, pest management, water management, waste management, input procurement, chemical usage
Society & Culture	Co-creation and Sharing of Knowledge Human and Social Values Circular and Solidarity Economy	Women's empowerment Youth employment opportunity	Information-sharing, relationships with other farmers, opportunities to engage young people under 18 years old on the farm, opportunities to engage older people above 65 years old on the farm
Health & Nutrition	Culture and Food Traditions	Exposure to pesticides Dietary diversity	Presence of traditional food culture, presence of regional food culture
Governance	Responsible Governance	Secure land tenure (or mobility for pastoralists)	Familiarity and participation in government programs, barriers experienced, supports desired

Note: The Food and Agriculture Organzation of the United Nations (FAO) identified the five dimensions to guide sustainable food system development, the 10 Elements to conceptualize agroecology, and the Tool for Agroecology Performance Assessment to measure agroecology (FAO, 2019; Mottet et al., 2020).

electronically from November 2020 to January 2021 and generated 75 usable responses. The total number of women farmers who received the invitation to participate is unclear due to the snowball nature of the distribution, so a percentage response rate cannot be estimated (Naderifar et al., 2017).

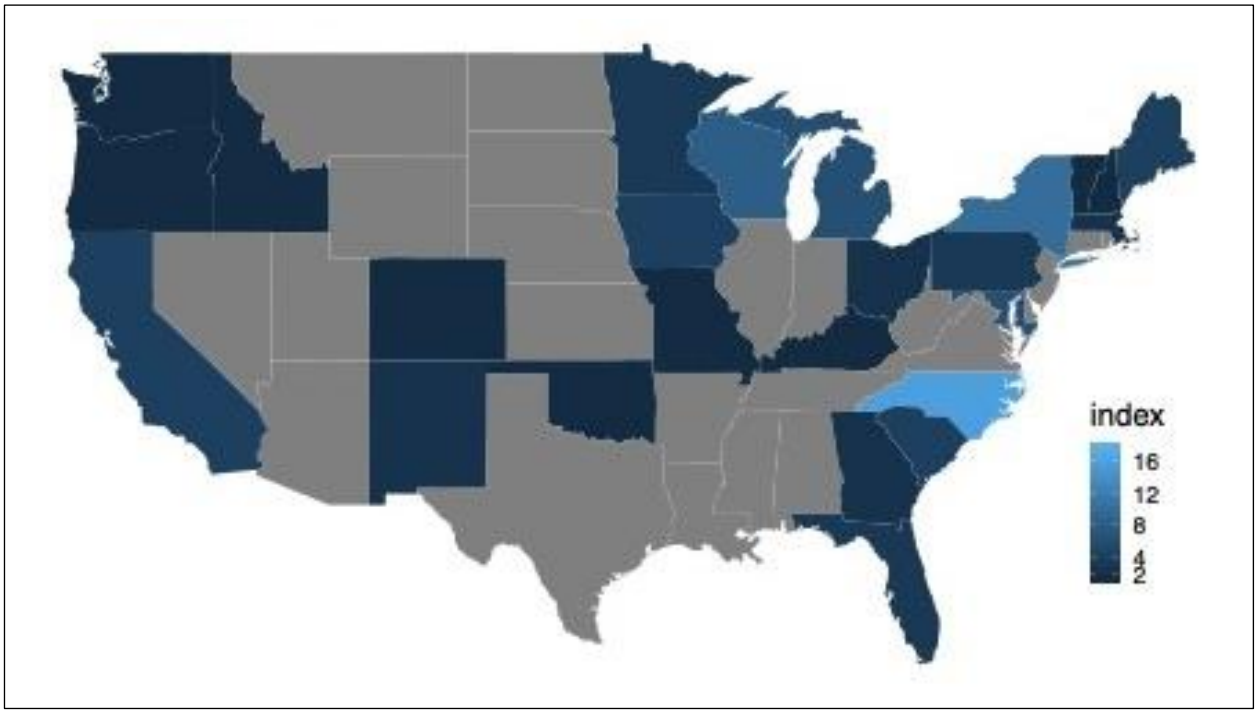
The semi-structured interviews were conducted as follows. Selection criteria were that participants had to identify as women, have practiced farming in the U.S. for at least two years, and occupy a leadership role in a farming enterprise. These criteria were broader than the survey criteria to include women engaged in leadership roles as farmers, growers, and food producers who may not readily identify as primary farm decision-makers. For example, some of the women identified professionally as executive directors or entrepreneurs, or with their additional off-farm job. A broad approach for interview participants allowed for a better understanding of the nuances in the current landscape of women farmers. To identify participants for interviews, women farmers were invited through convenience sampling, snowball sampling, and direct outreach on social media. Interview data were collected from 12 participants from October 2020 to December 2020. Each interview lasted between 45 minutes and one hour. Table 2 lists a descriptor of interview respondents, what they produce, and their geographic community type.

The geographic distribution of all 87 study participants is shown in Figure 1 by state and frequency, with most participants from North Carolina because we were based in North Carolina and had easier access to local outreach networks. Most participants were 30–39 years old (39%), followed by 40–49 years old (20%), 60 or older (19%), 50–59 years old (14%), and 20–29 years old (8%). Eighty-two percent of participants identified as White, while 6% identified as Latina, 6% as Native, 5% as Black, and 1% as Asian. Most participants lived in rural communities (62%), followed by sub/peri-urban (27%) and urban (11%) communities. In this study, "sub/peri-urban" is used to describe a zone of transition between rural and urban areas (UNESCO, 2021). Nearly three quarters of participants (74%) farmed on less than 50 acres (202 hectares) of land. Half of the respondents farmed with a male partner or spouse, and 57% owned their farmland as the sole owner or with a spouse, through their family, or through other co-ownership arrangements.

Table 2. Descriptions of 12 Interview Participants by Professional Title, Product, and Community Type

ID	Professional Title	Products	Community Type
F1	Farmer	Flowers	Rural
F2	Entrepreneur Teacher	Seedlings Education programs	Urban
F3	Entrepreneur Teacher	Seedlings Education programs	Urban
F4	Part-time farmer Executive director, NGO farming network	Vegetables	Sub/peri-urban
F5	Farmer Scientific researcher	Vegetables	Sub/peri-urban
F6	CSA farmer	Eggs, meat, and vegetables; organic	Sub/peri-urban
F7	CSA farmer	Heritage pork, poultry, and eggs	Sub/peri-urban
F8	Farmer	Specialty potato varieties	Rural
F9	Member of an organic farm collective	Tomatoes	Sub/peri-urban
F10	CSA farmer on farming collective	Vegetables; organic	Rural
F11	CSA and market farmer	Vegetables	Rural
F12	Executive director of farm	Vegetables; Community education	Urban

Figure 1. Frequency of All Participants by State



Data Analysis

Survey data were initially explored through Qualtrics bar charts, descriptive statistics, and crosstab queries. Analyses of variance were performed as generalized linear models in R version 4.0 on quantitative survey data to assess the effect of farm size and geographic locations of farms. Geographic locations were defined along the Natural Resource Conservation Service (n.d.) regional boundaries within the USDA. Specifically, the Northeast region included Maine, Maryland, Massachusetts, New York, New Hampshire, Pennsylvania, and Vermont; the Southeast region included Florida, Georgia, Kentucky, and North and South Carolina; the Central region included Iowa, Oklahoma, Michigan, Minnesota, Missouri, and Wisconsin; and the West region included California, Colorado, Idaho, New Mexico, Oregon, Washington. Spearman rank correlation coefficients (ρ) were computed on Likert-scale rankings. Open-ended survey data was imported to NVivo qualitative research software for thematic coding and word frequency analysis. Data were analyzed through word frequency and matrix queries. Interviews were recorded and transcribed, and transcripts were uploaded to NVivo for coding and analysis. Coding was done over three phases: key dimension, agroecology element, and emergent themes.

The 10 Elements of Agroecology were computed by aggregating survey questions per the FAO rubric. For each element, we computed indices using the rubrics outlined in the Mottet et al. (2020) appendix, which assesses each index on a scale of 0 to 4. Where appropriate, scoring of the rubrics was adjusted for available data because the study was in the U.S., a high-income nation, and centered on women, as described above. Synergies focused on crop-livestock-soil integrations because insufficient data was available on landscapes or forests other than orchards. Each agroecology element was examined for interactions between farm size and USDA region as described above.

Results

For each of the five FAO dimensions, we provide an overview of the data collected from the survey and then incorporate the interview data to corroborate the survey data and present emergent themes.

Our results indicate that themes emerging from the in-depth qualitative interview data generally support the quantitative data from the online surveys. The quantitative survey data also suggest that, for some factors, the size of the farm and its geographic location affect women's farm management decisions.

Key Dimension 1: Economy

In the key dimension of Economy, participants were asked to explain how they measured and defined success, and to describe their products, business models, and sources of income.

Farmer Motivations and Metrics for Success

Participants were asked to indicate their motivations for becoming farmers and their metrics for conceptualizing success. Eighty-four percent of women surveyed indicated that they were motivated to become farmers to grow healthy food for their families and/or communities and 71% desired to work outdoors. In an open-ended survey question about how they defined and measured success, the two most frequently used words were "community" (n = 27) and "people" (n = 26). Interview data reinforced social motivators. One farmer (F11) described success as "feeding ourselves, and sharing what we have and our knowledge with the greater community." Other interviewees described success as a combination of social, economic, and environmental indicators. For example, F9 stated, "We're not wealthy, we're not looking at being the most profitable. We're looking at using the best ecological processes and taking care of people." These responses show that producing food that feeds their families and communities is a prominent motivator for these women farmers.

Income Sources and Sales Models

While 24% of participating farmers derived all their income from product sales, the remaining farmers derived income from other sources that included off-farm employment, grants, social programs, property rental, retirement income, and scientific research in affiliation with a university (Figure 2). Income sources relate to farm size (Figure 3). As farms increase their size toward 100 acres (40 hectares), they decrease their utilization of off-farm employment. The smallest farms (≤10 acres, or 4 hectares) most utilized off-farm employment and grants in addition to product sales. Farms with 11–50 acres (4–20 hectares) were most likely to utilize agritourism and education with product sales and off-farm employment, and farms with 51–100 acres (21–40 hectares) relied most heavily on product sales.

Survey respondents mostly used combinations of direct sales models in their local communities to sell their products, such as farmers markets, CSAs, farm stands, restaurant contracts, and online farm sales. Figure 3 shows the distribution of sales model by farm size. The smallest farms (≤10 acres) most utilized CSAs and farmers markets. Midsize farms (11–100 acres) used online sales, farmers markets, and direct sales from farm stands, and the largest farms (101+ acres) sold to grocery stores or other centralized purchasers. Thus, the data show that 100-acre farms or smaller, which were 90% of participants in this study, typically utilize direct-to-consumer sales models.

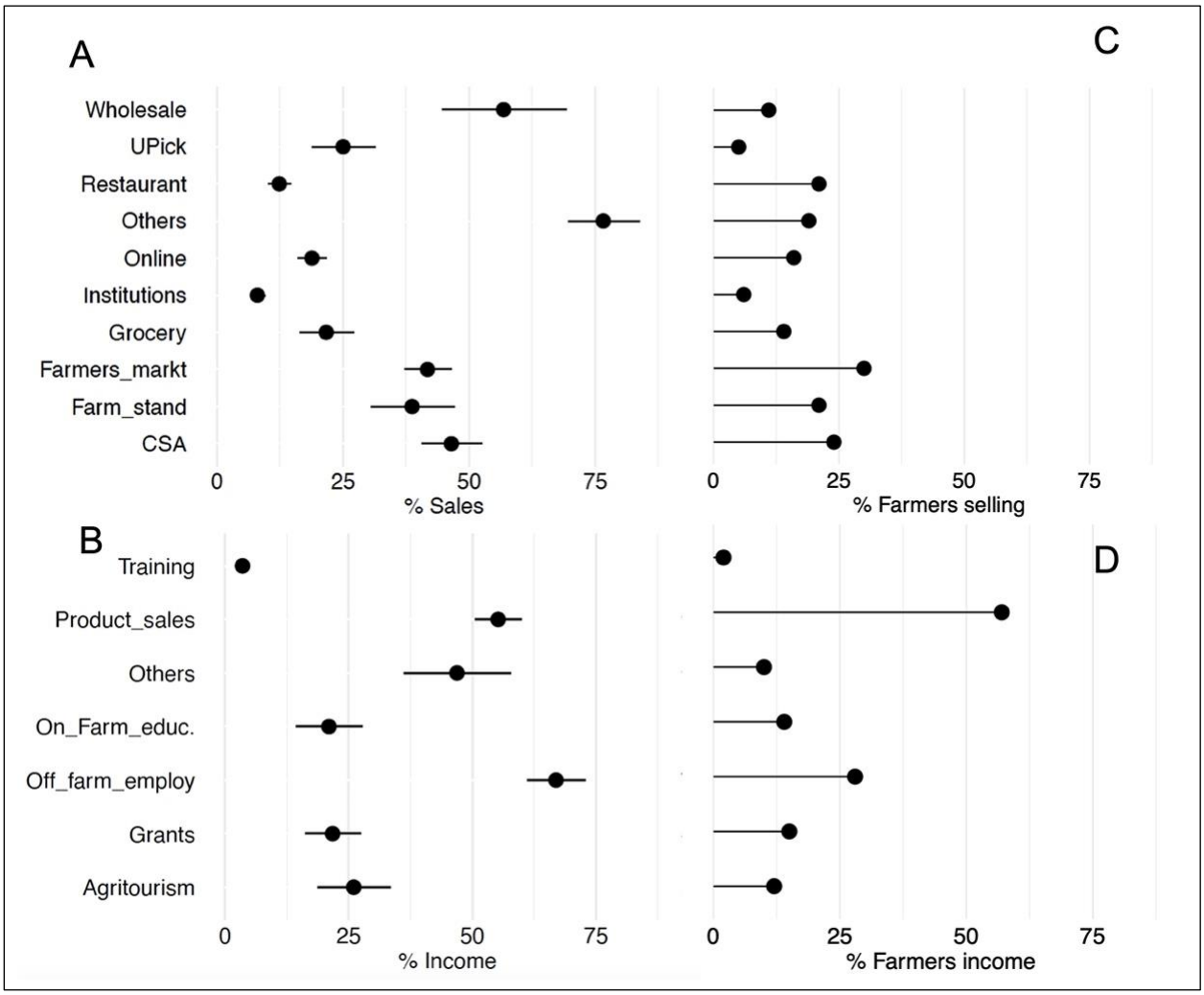
Inclusive Economic Practices

The interview data indicated that the women incorporated practices into their farming businesses that responded to the financial needs of the community. Four strategies emerged: sliding scales, workshares, donations, and accepting government nutrition benefits. Seventy-five percent of interviewees, along with 23% of survey respondents, indicated that they incorporated one or more of those practices into their business models. One farmer (F8) explained her sliding scale approach to selling her products:

> I say [to customers] that a quart is normally [US]$4 but it can be anywhere from [US]$2 to [US]$6—you pay what you can afford. The majority of my customers either give me what I'm asking or they give me more, and that allows me to lower my prices for somebody who might need it. But it's actually helping me either break even on those individual sales or earn more than I expected.

Twenty-five percent of interviewed farmers described using a workshare CSA model to

Figure 2. Income Sources and Sales with Proportion of Surveyed Female Farmers Using Them

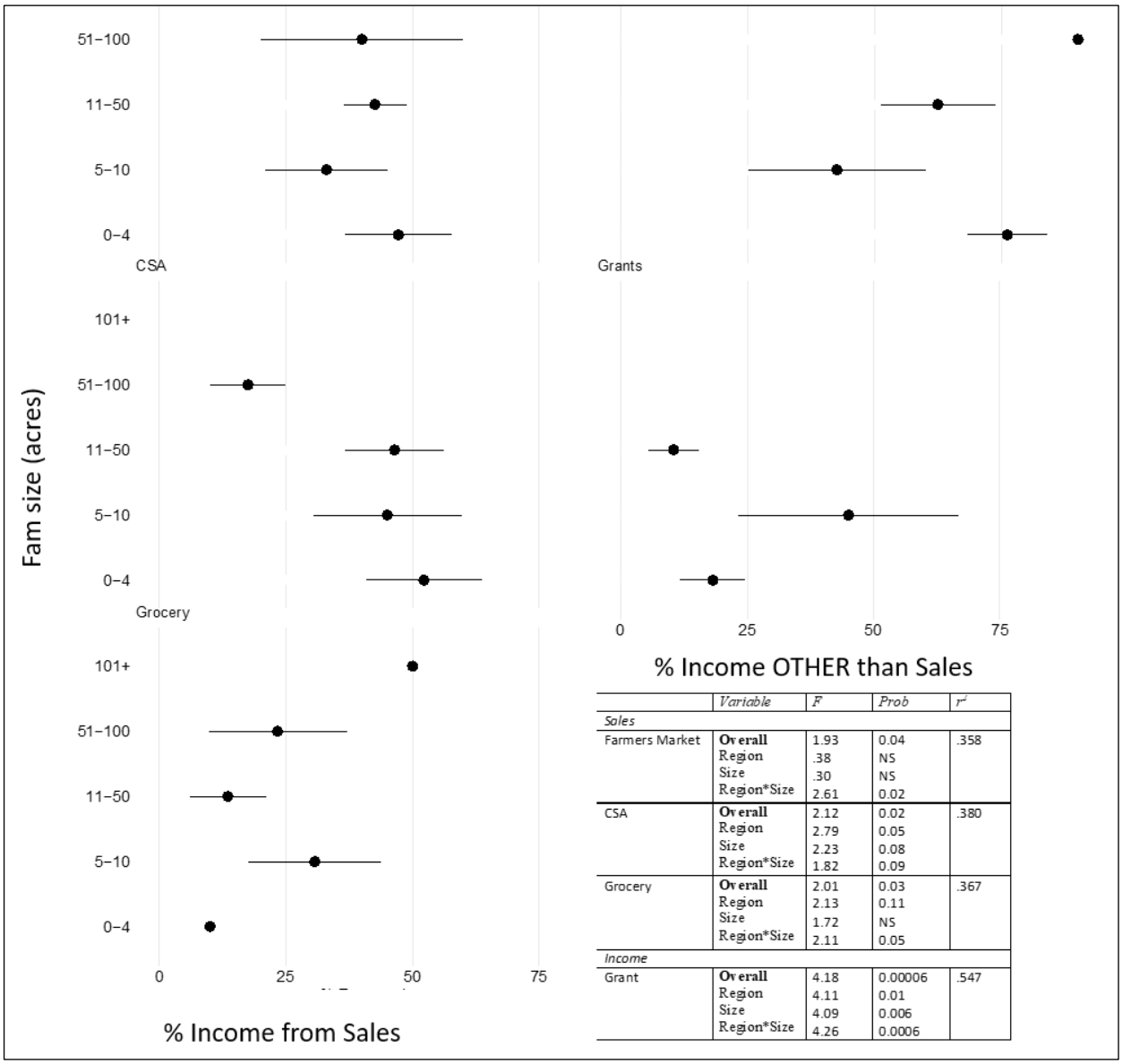


Note: The proportion of different avenues for sale of farm products (A) and other sources and activities for income sources and activities (B) is shown along with the proportion of farmers using them (C for sales and D for income). For A and B, circles indicate mean +/- the standard error of the mean (bars).

exchange food for labor. One farmer (F11) asks for two hours per week of labor in exchange for the wage equivalent in vegetables, while another (F10) offers workshares to local college students. This arrangement is mutually beneficial because people who might not be able to afford a CSA share can obtain fresh produce while the farmer can obtain labor. F11 described the community response to her workshare program as "overwhelming," noting that older rural residents were particularly interested.

Another 25% of interviewees built community donation into their business model. F1 describes the satisfaction she derives from her flower donation program: "[We donate to] all the schools, for teachers' events, hospice care, the ASPCA. Just to be able to have something to give back to the community is priceless." F9 lives on a farm collective in a peri-urban community that allocates produce weekly for donation to food banks. Her farm also runs a pick-your-own operation that asks customers to donate 20% of the produce picked. On F12's urban farm, she reserves 10% of produce for donation by designating community beds for people to harvest food as needed.

Figure 3. Effect of Farm Size on Percentage of Income Derived from Sales and Other Sources by Farm Size for Women Farmers Surveyed



	Variable	F	Prob	r^2
Sales				
Farmers Market	**Overall**	1.93	0.04	.358
	Region	.38	NS	
	Size	.30	NS	
	Region*Size	2.61	0.02	
CSA	**Overall**	2.12	0.02	.380
	Region	2.79	0.05	
	Size	2.23	0.08	
	Region*Size	1.82	0.09	
Grocery	**Overall**	2.01	0.03	.367
	Region	2.13	0.11	
	Size	1.72	NS	
	Region*Size	2.11	0.05	
Income				
Grant	**Overall**	4.18	0.00006	.547
	Region	4.11	0.01	
	Size	4.09	0.006	
	Region*Size	4.26	0.0006	

Note: Data shows mean (circle) +/- standard error of the mean (bar). Farm size (acres) was shown to significantly affect the type of sales and income revenue for female farmers. The box insert shows significant statistical values. Only income sources from sales and others that were statistically affected by farm sizes are shown.

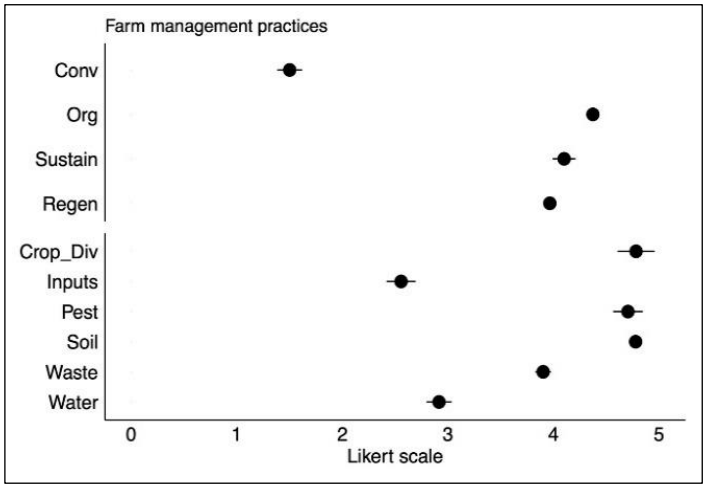
Key Dimension 2: Environment

Questions in the key dimension of Environment relate to agricultural biodiversity, soil health, water, and climate change mitigation. Participants were asked to evaluate the levels of crop diversity on their farms and how much they would identify their practices as conventional, organic, regenerative, or sustainable. They were also asked to assess their management practices on an agroecological scale.

Management Practices

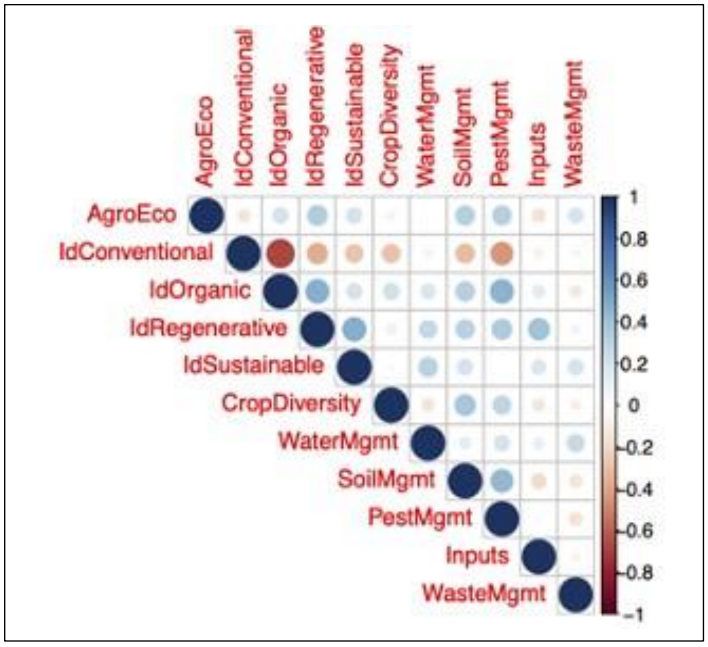
When asked about the degree to which they identify with different agricultural approaches on a

Figure 4. Survey Respondents' Self-Evaluation of the Agroecology of Their Management Practices



Note: Likert scale ranged from 0 (no knowledge/no practice) to 5 (fully knowledgeable/fully agroecological practice). Data shows mean (circle) +/- standard error of the mean (bar). The different types of farm management practices on the y axis refer to the degree of use from none (0) to highly integrated (5) and are water resource (water harvesting and saving techniques used), waste management (farm residues reused and recycled), soil (synthetic vs. organic practices used), pest (chemical used vs. biological control), types of inputs (market purchased vs. exchanged or produced onsite), crop diversity (monoculture vs. highly diversified). The y axis also refers to their assessment of the type of management used generally, whether conventional, organic, regenerative, and sustainable methods, as described by the USDA.

Figure 5. Correlation Matrix of Self-Evaluation Scores for Environmental Management Practices



Note: See Figure 4 for description of abbreviations.

scale of 0–5, respondents most strongly identified as organic followed by sustainable and regenerative, while the fewest participants identified as conventional (Figure 4). However, responses about conventional agriculture were dependent on USDA regions ($F=2.78$, $p\leq.05$), marginally interacting with farm size ($F=1.78$, $p\leq.1$) where farms of 51–100 acres in the Southeast were more likely to identify with conventional agricultural practices. Respondents evaluated themselves as having strong crop diversity, agroecological soil management, and sustainable pest management practices (Figure 4). However, they evaluated themselves lowest for agroecological water management and input procurement.

The farmers' identifications for agricultural approaches were correlated with their management practices (Figure 5). Strong correlation coefficients were found between those who identified with organic and regenerative farming ($\rho=0.472$), regenerative and sustainable farming ($\rho=0.477$), and organic and agroecological pest management ($\rho=0.469$). A strong correlation exists between soil management and pest management scores ($\rho=0.433$). Identifying as regenerative moderately correlates with practicing agroecological input procurement ($\rho=.39$).

Animal Integration

Survey data indicate a relationship between farm size and the presence of animals. Farms between 11 and 100 acres have the greatest presence of cows, pigs, goats, sheep, and chickens. Interviewees described the critical role played by animals in their production processes. For two interviewees, meat production was part of their farm model. In addition to producing meat products for sale, these farmers integrated the animals into their soil management by rotating them in fields between crops. The animals' grazing and movement aerated the soil and managed weeds, and their manure fertilized the soil. One farmer (F7) stated,

> My whole approach is letting animal power run my farm, utilizing the lands effectively with those animals, and then producing something that is so holistic to the whole picture that a little bit goes a long way. The flavor and quality [of my meat products] is unsurpassed.

Soil Building as Soil Management

Seventy-five percent of interviewees mentioned at least one of five agroecological soil management practices: cover cropping, crop rotation, compost application, animal manure integration, and humanure (human waste) integration. For two farmers, "healing" or "rebuilding" soil is an explicit objective of their farms. F5 said, "I want to find a space, heal it, design the system, make sure that it is up and running, and then find another space and do the same thing somewhere else." F8 describes her philosophy of soil building as an investment in the future. She said,

> I'm trying to get the organic levels in the soil back up. We're trying to be no-till, and we are almost there. It takes a long time. I've learned that, in order to have something healthy like no-till, you often need a healthier environment to start with. You can build those healthy environments, but this is all an investment in the future. This is why people get frustrated with organic, because for the first couple years it might work, but it's going to take 10 or 20 years before you're seeing the radical beautiful amazing results that you see in the books.

Key Dimension 3: Society and Culture

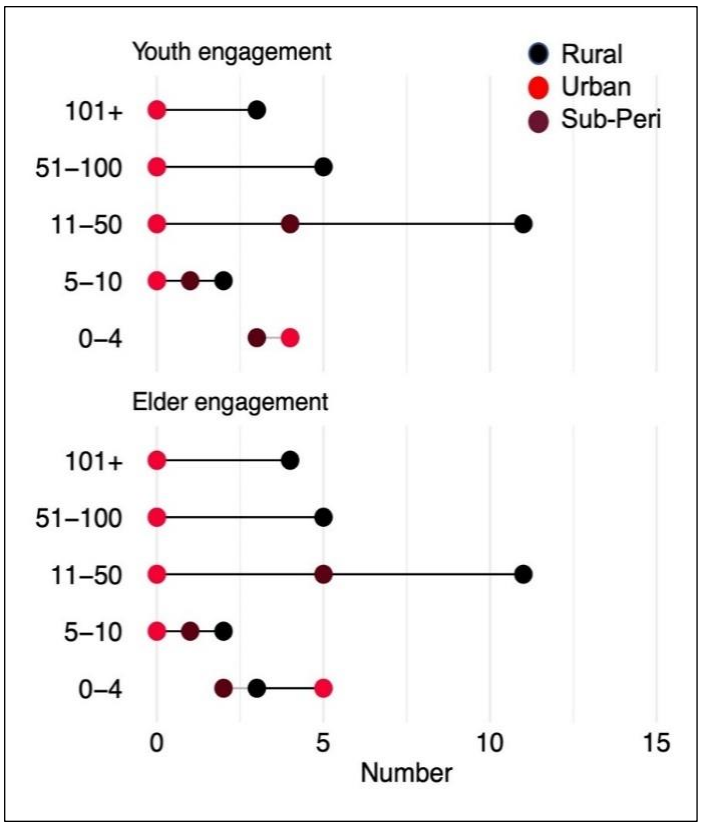
Questions in the key dimension of Society and Culture relate to social relationships through the inclusion of younger people and older people on the farm, and relationships with other farmers.

Opportunities to Engage Younger and Older People

Half of the survey respondents offered opportunities for young people (51%) and/or older people (53%) to participate on their farms. Rural farms were particularly likely to incorporate opportunities for older and younger people, as shown in Figure 6.

In the interviews, eight out of 12 interviewees indicated that providing opportunities for intergenerational participation through engaging younger and/or older people was part of their farm models. They referenced three strategies: school partnerships, university partnerships, and workshare CSAs. F10 brings young people from a local primary school and a university to her farm. She has arranged for students at the primary school to visit the farm weekly for work and play. This farmer also partners with the local university to offer farm work opportunities, arranging for students to use their meal plans to purchase CSA shares. On her urban farm, F12 emphasizes the inclusion of elderly people in her programs. She says,

Figure 6. Frequency of Offering Opportunities to Engage Participation of Older and Younger People by Community Type Among 75 Farms Surveyed



> A lot of our neighborhood is made up of elderly people who purchased their homes in the '40s or '50s and are still here. We're going to build raised beds so that the elderly won't have to bend down. If they want garden beds in their house, we're going to have programs where we'll build them. Most of our Community Association meetings are people in that age range. We go to them every month, and we talk about our project, and people are excited. They remember when their parents had a garden—there's a lot of knowledge.

These programs expand the farms' capacities to serve their communities while broadening their customer bases.

Knowledge-Sharing Enterprises

Eighty-four percent of the study's participants indicated that they teach, train, and share their knowledge with others. The most common strategies referenced by interviewees were to offer workshops and to organize community events. Five interviewees said they encountered barriers to obtaining agricultural knowledge due to their race or ethnicity, gender, or both. These barriers inspired them to create new business ventures. F2 and F3 were motivated to open their own plant nursery because they felt unwelcome in white-owned plant nurseries as Black gardeners. F2 said,

> [Black] people are a lot more relaxed when they're around us and ask us a lot more questions not just from us having a nursery but being interested in gardening for so long. We went to local nurseries, and the way we get treated as customers at some places and the knowledge that we don't gain . . . if we didn't have it or know it, we would just have to look it up.

Another interviewee (F4) felt that her ethnic group was not visible within the farming landscape of the U.S., so she created an organization to develop a community for farmers who share this identity.

> I would meet people who were [in my ethnic group] and farming and they had no concept that the work that they were doing was actually connected to their heritage and their ancestors. We saw this lack of a community as an opportunity and we decided to fill the hole. The more we dig into this work, and the more visible we become, the more we hear from people, "Wow, I've been looking for something like this for so long."

Key Dimension 4: Health and Nutrition

Questions in the key dimension of Health and Nutrition relate to the presence of traditional and regional food cultures. Traditional food refers to food eaten in communities for many generations, and regional food refers to food grown and produced in a particular geographic area.

Regional and Traditional Food Culture

Survey respondents were asked to evaluate the strength of regional and traditional food cultures in their communities on a Likert-scale of 0–5. Respondents indicated a greater sense of regional food culture (mean=3.0) than traditional food culture (mean=2.5). While 12 respondents scored their sense of regional food culture at a 5, zero respondents scored their sense of traditional food culture at a 5. This dearth of traditional food culture is worth noting. Respondents also indicated that food is featured in their communities through the presence of locally owned non-franchised food businesses (72%), farm-to-table restaurants (64%), and festivals (53%), which form the infrastructure for regional food culture.

Food Preparation

Many interviewees viewed the lack of strong food culture as a business opportunity. In addition to growing food, these women teach food preparation and host farm-to-table meals. The food workshops and experiences target a range of consumers. F11 has written proposals for her local Cooperative Extension office to develop cooking classes because she noticed the erosion of cooking skills in her community. She attributed this issue to a lack of time and the inability to afford whole foods, noting that exhaustion and time scarcity make people more dependent on cheap pre-prepared food. F7, meanwhile, offers gourmet food experiences

that target high-income consumers. She grows heritage meats and leads cooking demonstrations that teach customers to use different cuts. By combining global culinary traditions with community events, this farmer has created a vibrant business. She said,

> The farm is the site of these big gatherings like a whole goat roast. We do it by donation or we sell tickets, but we do these themed events on the farm. People then can come and see the animals, see how they're raised, enjoy what we've pulled together at the butcher shop. It's a full embracing of culinary traditions from all over the place. People will ask us to make scrapple from Philadelphia, and I'm like, "Sure, we'll do that."

Other interviewees described how teaching food preparation was part of their work. F9 built a partnership between her farm collective and the local elementary school. At the school, teachers incorporate the farms into the curriculum, and the lunchroom celebrates local farmers and connects them to the food being served. F12 offers food preparation education on her urban farm in response to the need in her community. When she distributes produce at her market stand, she answers questions and offers ideas for preparing the vegetables. This approach, she said, has the dual function of building relationships and teaching cooking skills.

Key Dimension 5: Governance

Questions in the key dimension of Governance relate to how participants have engaged with government services, the barriers they experience, and the supports they would like to be provided by the government.

Engagement with Federal Programs

The U.S. government offers federal programs to help farmers nationwide. About half (53%) of survey respondents indicated that they have received support from the federal government. The programs with the highest participation rates were the National Organic Program (21%), coronavirus assistance program (19%), nutrition programs (16%), conservation programs (10%), loans (9%), and crop insurance (8%). Program participation related to farm size. The smallest farms utilized the Supplemental Nutrition Assistance Program (SNAP) more than the largest farms, though it is unclear how many use the program as a recipient or as a vendor.[2] All farm sizes utilized the National Organic Program and the conservation programs evenly, and only the largest farms used crop insurance programs. While nearly half of survey participants (47%) described their farming practices as organic, only 21% participated in the National Organic Program. F6 chooses not to participate in the National Organic Program despite practicing organic farming because she says it does not add value for her. Because she operates a CSA for her local community, she says that trust and transparency in her methods function in place of the government label, and she views the program as valuable only for distribution at a national or international level.

Public Valuation of Food as the Biggest Income Barrier

For survey respondents, the most common barrier they experienced was income (27%). This barrier encompasses responses such as the low value placed upon food by consumers, the discrepancy between the high value of land and the low value of food, and farmers' ability to earn a living wage. Interviewees reinforced the idea of the barrier presented by Americans' low valuation of food. F10 said,

> I wish people would value their food more. I think the U.S. only spends 6% of their income on food, while other countries do 20% or 30%, 50%, depending on where you are, how poor you are. And there's so much waste here—food waste, in production and in the fridges of people. I think it's 30 or 40% that the U.S. wastes on food. So we're supposed to

[2] The Supplemental Nutrition Assistance Program provides publicly funded nutrition benefits to eligible families with limited income and resources in the United States (USDA FNS, 2021).

> produce super cheap, and then consumers don't care because it's so cheap. Then we can't make a living.

Government Support Desired: Infrastructure and Resources for Small Farms

Participants were asked to indicate their requests for government support. The largest category of requests related to programs that center the needs of small farms instead of large corporations (31%). Participants requested grant programs for farmers to develop infrastructure, build online platforms, and access markets. They requested subsidies to raise wages for farm labor and to implement regenerative practices. Lastly, they sought relief for healthcare, childcare, and student loan expenses. Interviewees praised existing government programs that served these functions. F8 referred to a state program that helped her, saying

> [My state] has a program—if you graduate from any university or college and within 2 years agree to farm in [that state] for 5 years, they will pay off all of your student loans up to $50,000. I received that, so I have had far fewer financial burdens than your average young farmer coming out of college.

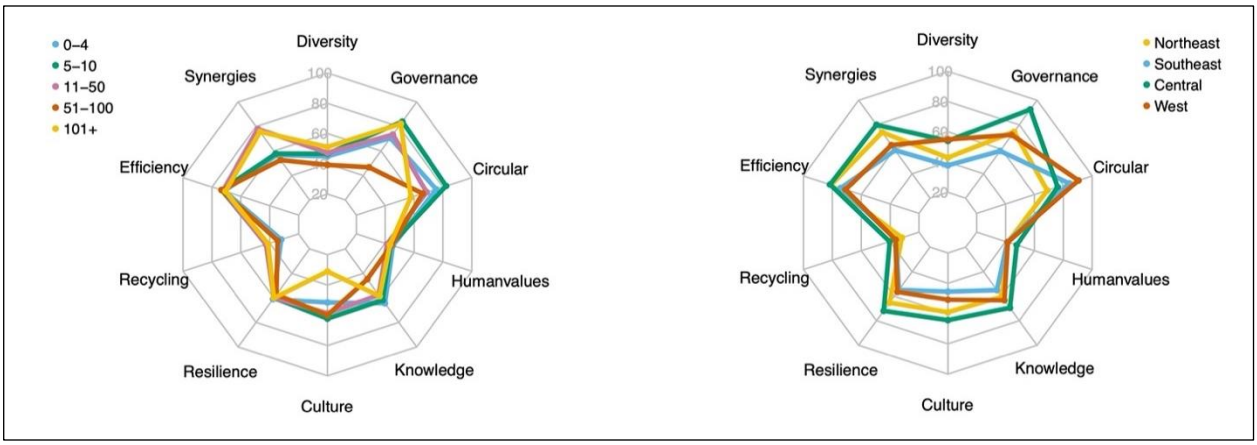
The 10 Elements of Agroecology

In line with FAO criteria, indices that compose the 10 Elements of Agroecology were used to integrate survey responses of women farmers. Each element was analyzed by farm size and by USDA region as shown in Figure 7. Overall, the Synergy, Governance, Circular Economy, and Efficiency were the highest and ranged between 68% $\pm$ 3 (Synergy) and 74% $\pm$ 1 (Efficiency) compared to Recycling and Human and Social Values, which were the lowest (42% $\pm$ 2 for Recycling and 47% $\pm$ 2 for Human and Social Values). Of the 10 elements, general linear models that included both farm size and region were significant for Synergy and Governance ($p \leq 0.03$ and $p \leq 0.005$ for Synergy and Governance, respectively). Furthermore, farm size significantly affected these indices ($p \leq 0.03$ and $p \leq 0.02$ for Synergy and Governance, respectively), where farms of 51 to 100 acres had lower indices than larger farms or smaller ones. Only Governance showed a significant interaction between farm size and region ($p \leq 0.02$) because the farms located in the southeastern region were less likely to use government programs. Recycling was only marginally affected ($p \leq 0.08$) by both factors because of the interactions between farm size and region ($p \leq 0.02$). No significant effect of region or farm size was found in other indices.

Discussion

This study sought to examine the practices and approaches of women farmers throughout the U.S.

Figure 7. Effect of Farm Size and Region on the 10 Elements of Agroecology



Note: Each line represents average values per category. Analysis of variance for the combined farm size (acres: left panel) and USDA regions (right panel) showed significant effects for Synergy ($p \leq 0.03$) and Governance ($p \leq 0.005$), while Recycling was marginally significant ($p \leq 0.08$).

and how those practices and approaches align with the FAO's Elements of Agroecology. Studies in developing countries demonstrate that women farmers are leaders of agroecology projects due to their capacity for organizing social networks, and their roles within families and communities. We hypothesized that women in the U.S. would also be leaders of agroecological farming projects. We found that the majority of women whom we surveyed and interviewed were leaders of agroecological projects that provide direct nutritional, educational, environmental, and social services to their communities in alignment with several elements of agroecology.

Women Farmers in the U.S. and Agroecology

The women in this study were motivated to become farmers by a desire to grow food for their families and communities and to work outdoors, in alignment with findings from prior studies (Bregendahl & Hoffman, 2010; Chiappe & Butler Flora, 1998; Wells & Gradwell, 2001). Consistent with findings in Pennsylvania from Trauger et al. (2009), these women farmers utilize direct sales models and offer education and experiences as products, thereby fostering locality-based food systems. Also consistent with findings from Trauger et al. (2009), participants throughout the U.S. measured success through metrics related to caring for their communities and caring for land in addition to profit and productivity. These motivations and values undergird the structure of farm models that nourish, educate, and connect local communities while stewarding natural resources.

Small Diversified Farms for Local Consumption

Consistent with census data since 1978, these women farm on smaller acreage than the national average. Ninety percent of the participants farm on 100 acres (40 hectares) or less compared to the national average farm size of 444 acres (179 hectares; USDA NASS, 2020). The women in this study produce vegetable, flower, and animal products that they sell through direct-sales models to their local communities. The diversified direct-sales farm model aligns with the FAO's agroecology elements of Diversity, Resilience, Culture and Food Traditions, and Circular and Solidarity Economy. The utilization of direct-sales models is consistent with the finding from Ahearn et al. (2018) that women in the U.S. are more likely to use direct marketing channels than their male counterparts. Direct sales strengthen localized food chain relationships for increased resilience, which proves particularly valuable during disturbances such as the COVID-19 pandemic, as shown by Tittonell et al. (2021). Localized relationships are also valuable for providing nutrition assistance to food-insecure populations. The income streams of the participating farms were diversified between product sales, social programs, and grants, with increasing reliance upon product sales as the farm size surpassed 50 acres. The urban farms relied particularly on grant-funded social programs for income. By offering social programs to local communities, farms strengthen social networks and accrue social capital, thereby increasing producers' ability to reach consumers—particularly those who are marginalized—and provide them with access to healthy food. Providing both products and services also diversifies farm income streams for increased economic resilience.

Social Programs to Educate and Connect Communities

Eighty-four percent of participants teach, train, and share their knowledge with others, and about half of participants offer opportunities for intergenerational engagement with younger and/or older people. These social programs include culinary workshops and events, workshares, and work days for children, youth, or other community members. These programs connect people with nutritious food and food-related skills and knowledge while building community. The social programs align with the FAO's agroecology elements of Co-creation and Sharing of Knowledge, Human and Social Values, Culture and Food Traditions, and a Circular and Solidarity Economy. These programs capitalize upon the farm as a space to generate knowledge and build community in addition to produce food (Di Masso et al., 2022; Trauger et al., 2009). By building connections with schools and universities, farmers support the integration of food and agriculture into the curriculum. This knowledge transmission infrastructure has economic value because it fosters future generations of

farmers and food professionals in addition to strengthening public health (González De Molina & Lopez-Garcia, 2021). Some participants referenced gaps and barriers related to their local food and agriculture economies that they used as opportunities for innovation, extending nationally the findings from Trauger et al. (2009) for the state of Pennsylvania.

Care for Reproductivity of Environmental Resources

Efforts to heal land and rebuild soil contribute to sustaining natural resources, maintaining living ecosystems, and investing in long-term productivity. These practices align with the FAO's elements of Diversity, Synergy, Recycling, and Resilience as well as the feminist economic values articulated by Di Masso et al. (2022) of care provision and reproductive work. Respondents indicated using practices for soil stewardship in accordance with agroecological management such as capturing organic waste as fertilizer, applying cover cropping and crop rotation, and integrating animals for tillage, weed management, and fertilizer. However, though the federal government offers programs to incentivize natural resource conservation, only 10% of these women participate. Increasing the participation rate of women farmers in federal natural resource conservation programs would provide women with resources to expand their capacity to practice agroecological farming.

Respondents indicated their lowest level of confidence in agroecological water management and input procurement practices. One interviewed farmer referenced water management practices for farming in the desert that she learned from her grandfather in Mexico. These findings on knowledge gaps and traditional knowledge are useful to inform strategic planning for conservation outreach and training programs. Prior research has shown that women are likely to acquire and implement conservation practices due to their social networking and knowledge-sharing practices (Barbercheck et al., 2014). By targeting training about water management, input procurement, and traditional Indigenous farming techniques to women, conservation outreach programs would expand their impact for effecting an agroecological transition.

Alternative Economic Models from Women-Led Farms

The women-led farm models described in this study face considerable challenges. Such challenges are consistent with the case study about farm closure by Dubisar and Slocum (2022), which provides an in-depth examination of a woman's decision to close her small, diversified direct-sales vegetable farm. The researchers emphasize that farmers decide to leave farming for several reasons that relate to finances, burnout, boredom, and identity shifts. Dubisar and Slocum (2022) encourage farmers to share their farm-closure stories to illuminate the systemic challenges facing small-scale regional food production. To address these challenges, Dubisar and Slocum propose reconceiving small-scale farmers as public service providers similar to teachers or healthcare workers, and funding them as such. Alternatively, given that 67% of female farmers do not list farming as their primary occupation (compared to 54% of men) and 62% of farms run by women earn under US$10,000 (compared to 54% of farms run by men), there may be value to expanding the practice of farming as a temporary or additional occupation (USDA NASS, 2019). A farm model in which farming is not the only source of income during one's lifetime has value in terms of economic resilience. Providing publicly funded infrastructure for temporary or shared use of land and equipment would encourage the expansion of these models of farming.

The Role of Farm Size

This research indicates a relationship between farm size and business model, environmental practices, and social value. Further research into the relationship between agroecology and farm size would be useful. We do not suggest that the farm models described by this study are the exclusive solution to food provision in a national agroecological transition. Rather, they are components of a diverse portfolio of food production enterprises that serve different functions, communities, and needs. Small urban farms gather community and promote food security, and midsize diversified peri-urban farms operate CSAs and contract with local restaurants and institutions, while large farms are best suited

for the production of regionally dependent crops such as grain and fruit. Understanding how women practice farming—by emphasizing local nutrition, environmental care, and education—and the value that women farmers offer to different communities would support policies that expand gender equality in agriculture throughout the nation.

Limitations

Given the exploratory nature of this study, these findings may not be representative of all women farmers in the U.S. and warrant further investigation about key findings. In comparison to the most recent Census of Agriculture data of women farmers nationwide, the sample in this study has an overrepresentation of smaller farm sizes that use organic methods and direct sales models. For example, 75% of study participants farmed on 50 acres or less compared to 48% of women nationally who farm at 49 acres or less (USDA NASS, 2017). In addition, this study had an extremely small sample size of women who farm on more than 100 acres (8%) while at the national level, 24% of women farm on 180 acres or more (USDA NASS, 2017). While 47% of participants identified as farming organically, only 1% of women farmers on record through the census use organic methods. While 90% of participants use a direct-sales model, only 8% of women nationally sell directly to consumers (USDA NASS, 2017).

Several possible explanations for these discrepancies are worth noting. First, the presence and role of female leadership on farms is complex to delineate. At the national level, any farm with one woman on an operating team is considered to be female-led. The differences between farms led exclusively by women, farms led in partnership with men, and farms led by women along with a majority of men may make different operating decisions. Because the survey participants and interviewees were identified through farming social networks, they capture a demographic of women farmers that differs from the demographic captured by the census. In addition, the number of women in the study who chose to certify as organic was far lower than the number of women who self-identified as organic farmers, showing that the number of certified organic farmers documented in the census is not representative of all farmers who practice organic farming. The same gap may apply between farmers who report practicing direct sales models in comparison to farmers who self-identify as practicing direct sales models.

Conclusion

This research study sought to gain understanding about how women practice farming in the U.S. in relation to the FAO's Elements of Agroecology. We found that the participants were motivated to farm by a desire to produce food to feed their families and communities. The majority operated farms on under 100 acres that grew diversified products that they sold directly to consumers. Participants used strategies to extend food access to low-income consumers, to teach food growing and preparation skills, and to engage younger and older people in farm activity. Survey respondents indicated the strongest confidence levels in practicing agroecological soil and pest management and the lowest confidence levels for practicing agroecological input procurement and water management. Finally, farm size and region were significant for the presence of agroecological management practices. These features of farming enterprises led by women in the U.S. offer value when considering investments in an agroecological transition. Similar to women in low-income countries, our data on women farmers in the U.S. highlight women's key role in the transition to sustainable agriculture in high-income countries. This research posits that an agricultural landscape built upon gender equality in the U.S. would lead to increased nutrition, knowledge, and cohesion for communities, as well as stewardship of soil and water resources. These women-led farm models connect to Gliessman's five levels of transformation from industrial agriculture to agroecology. They provide blueprints for redesigning agroecosystems in Level 3 and re-establishing direct connections between growers and consumers in Level 4 to make progress toward achieving the global food system of Level 5 that is built upon equity, participation, democracy, justice, and the restoration and protection of life on earth (Gliessman, 2016).

The women-led farm models described by this study are important pieces within a portfolio

of food production enterprises designed to serve different functions, communities, and needs. While this study is not representative of all women farmers, it provides insight about the unique value contributed by women farmers to the U.S. This insight can inform policy, planning, and programs that support gender equality and an agroecological transition in the U.S. in partnership with global efforts to build sustainable food systems. Further research that captures the impacts of sexuality, nonbinary gender identities, and intersectionality on farm management practices would be useful to advance understanding of the value of an equitable, inclusive, and diverse agricultural landscape. Additionally, research to explore the effect of farm size on agroecological management practices, and regional differences in agroecological management would be beneficial to facilitating an agroecological transition.

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Peasants' land rights and the hollowing out of communal property management in rural China

Xiaoyu Yu *
Kyoto University

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Abstract

In recent years, China has strengthened the land rights of peasants while weakening the system of communal ownership of rural land. This study explores the rationale of land ownership policies enacted in China since 1978 to understand the trend toward privatization. Commonly, support for land ownership privatization has rested on two main assumptions. First, it is seen as a means to protect peasants' interests and stimulate investment in agricultural production. Second, well-defined property rights may facilitate the transfer of land, thereby reducing transaction costs, and promoting the efficient utilization of land resources. However, this study finds that these assumptions in favor of strengthening peasants' individual land rights are not borne out in the strategic behavior of land-rights holders. The ambiguity in how the Chinese household registration system qualifies who is a peasant, and thereby endowed with rights, has effectively allowed urban migrants to retain significant control over the majority of rural land while showing little interest in local village affairs. Qualitative research conducted in Anhui province reveals that instead of privatization promoting efficient land utilization, it creates a divide between land managed by local peasants who have remained

* Xiaoyu Yu, Laboratory of Philosophy of Agricultural Science, Division of Natural Resource Economics, Graduate School of Agriculture, Kyoto University; Faculty of Agriculture Main Bldg. E319; Yoshida North Campus of Kyoto University; Kitashirakawa Oiwake-cho; Sakyo Ward; Kyoto 606-8502, Japan; +81-070-2413-0002; yu.xiaoyu.23s@st.kyoto-u.ac.jp

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committed to continuous cultivation and supplying fresh food, and land managed by absentees, which is often left idle for years or underutilized. This study contends that many elements of the increasingly marginalized communal land system are conducive to ensuring local food security, maintaining active rural governance, and preserving the social cohesion of rural communities.

Keywords
land privatization, common property, peasants, villages, rural-urban migration, local food security, rural communities

Introduction and Literature Review

In China, rural land is ostensibly under communal management, rather than individual ownership by peasants. Historically, natural villages or administrative villages[1] (collectively referred to as villages in this paper) have communally managed rural land. Since the establishment of China's Household Responsibility System (HRS),[2] peasants have been incrementally granted new ways of asserting land use rights. In the early 1980s, Chinese peasants were offered 15-year contracts to self-manage (but not to sell) newly distributed individual landholdings. In 1993, as the conclusion of the first round of land contracts neared, the government decided to make adjustments to land distributions to accommodate shifts in peasant household populations. Furthermore, they decided to allow more substantial 30-year land contracts, which would come into effect in 1997 (Central Committee of the Communist Party of China, 1993). As the end of this second round of land contract periods approached, the government opted to maintain the existing land allocation pattern for an additional 30 years (until 2027) to, as Xi (2017) suggested, provide Chinese peasants long-term and stable land use rights.

The escalation of individual land rights laws suggests that, despite a nominal system of communal ownership of rural land, China's system of rural land property rights has taken on quasi-private rights characteristics (e.g., Kung, 2002; L. Zhang et al., 2020). Despite the continuing ambiguity between private and communal, academic debates about the composition of land rights systems have often privileged the privatization narrative, focusing on the potential for achieving two goals: tailoring the land rights system to foster investments in modern agricultural production systems, while ensuring peasants' tenure to encourage productivity.

Some scholars claim that tenure insecurity has discouraged land investments and lowered output growth and, therefore, have called for deepened land privatization or tenure (Li et al., 2021), while other studies reveal a more complex picture. Several empirical studies have suggested that stronger tenure security rights positively affect long-term land investments (e.g., Gao et al., 2017; Q. Zhang, 2022). Private land rights can increase the marketization of land rentals and are a precondition for efficient land allocation (Qiu et al., 2021). However, other studies have argued that a common-property regime is better suited for the transition period of the Chinese agriculture industry. Liu et al. (2023) showed that land privatization leads to "brain drain" from the agricultural sector that

[1] In this article, the term "village" predominantly pertains to natural villages. Natural villages, also known as village groups in China, are historically evolved, typically comprising farming communities with strong geographical, social, and even kinship bonds. In contrast, administrative villages, also known as village committees in China, are usually established by government authorities to serve administrative functions. As a result, an administrative village may encompass more than a dozen natural villages and manage the livelihoods of thousands of residents due to administrative convenience, as illustrated by the case of the administrative village in this article. In such instances, these larger administrative villages may not fully encapsulate the essence of a rural community with a shared social life. However, it is worth noting that due to the complicated geographical landscape in China, there are circumstances in certain regions where administrative villages closely resemble natural villages.

[2] The Household Responsibility System (HRS) was introduced in China's rural areas during the late 1970s and early 1980s, signifying a noteworthy shift away from the previous collective farming model in favor of individualized farming by rural households. Under the HRS, although the land continued to be commonly owned, it was evenly distributed among individual rural families based on their household size. These households were granted the autonomy to determine their farming practices, sell their products, and lease the land out.

decreases productivity and output. In terms of investment, Lina et al. (2023) observed that privatization may encourage individual investment, but at the cost of communal investment.

While some scholars argue that Chinese peasants exhibit a preference for land privatization that can bring them more security (e.g., Qin et al., 2011), others suggest that individual productivity is not hindered by a perceived lack of tenure (Qian et al., 2022). Indeed, when unpacking the complexity of rural behavior, some scholars found that communal land systems are more advantageous to peasants and local communities in ways that are increasingly relevant to modern society. J. He et al. (2020) highlighted the desires of rural communities to assert communal (rather than patchwork individual) ownership of a forest. In doing so, they could strengthen their bargaining power vis-à-vis powerful external actors like tourism companies while providing fairer access to products like valuable mushrooms that are not easily commoditized. In a behavioral study in Southeast China, Yiwen and Kant (2022) found that peasants favor equitable land redistributions, especially for forested land. From a more practical viewpoint, X. He (2010, p. 331) argued that comprehensive agricultural land privatization would greatly complicate investment in communal infrastructure, such as agricultural irrigation, drainage, and farmland recomposition.

"Private Property" and "Common Property"

China's advocacy for land privatization is consistent with the global trend, although China has, in many ways, stopped short of providing conditions of private property mechanisms comparable to those found in other regions. Existing definitions of private property center around three characteristics: exclusivity, alienability, and the collocation of decision rights and consequences in the same entity. Only the owner can control how their object shall be used; this right of control is transferable, and the owner alone embraces the costs and benefits of their decisions (Dyson et al., 2019; Edmans & Holderness, 2017; Murtazashvili & Murtazashvili, 2016). The assumptions about market change and growth embedded in these conditions have led to the widespread belief that private property can create incentives for optimal resource allocation. The potential for such outcomes is related to the configuration of private property rights, which are less prototypical than the research depicts, even after successive phases of privatization in China under the HRS.

Concurrently, the system of communal property management in China has diverged from the classical configuration that has been regularly criticized by economists. Hardin's (1968) "The Tragedy of Commons" introduces the most influential idea about commons, but one that would be unrecognizable even under the pre-HRS communal land management system in China. According to Hardin, an individual herder is only minorly affected by overgrazing and is thus incentivized to increase animal count beyond the communal pasture's capacity. In recent years, many scholars have begun to differentiate among the diverse configurations of communal ownerships. Most contemporary models of common property explain it as an asset over which a discrete group of people shares ownership rights and exerts exclusionary power (D'Alpaos et al., 2023; Peredo et al., 2018; Sugden & Punch, 2014). Rather than being a prototype of private or common land ownership, incremental iterations of China's HRS reveal a complex ownership system in which private and communal characteristics interact to allow for unexpected outcomes. To understand the real-world outcomes of the evolving property rights regime, it is important to more carefully characterize the historical rural land management system in China.

The Decline of Common Property Regimes in Rural China

Since the foundations of the People's Republic of China were laid in 1949, the Chinese leadership has actively promoted collective agriculture. Private land ownership was abolished, and agricultural cooperatives were established. Rural land, livestock, and farming tools were transferred from individual peasants to these cooperatives. Peasants' work was quantified through "labor points" (known as *gong fen*), documented by agricultural cooperatives while prioritizing egalitarianism rather than returns on individual efforts. By 1956, agricultural collectivization had been realized throughout the country (Kerkvliet & Selden, 1998). Subse-

quently, the lack of peasant autonomy and low incentives to produce were blamed for the Great Famine, which lasted three years (1959–1961) and exacted a toll of 15 to 30 million lives (Lin & Yang, 1998) and led China to transition to the HRS. After 1978, China's agricultural economy experienced a period of substantial growth in which grain production increased by 4.7% per year between 1978 and 1984 (Huang & Rozelle, 2010). Many scholars have highlighted the decollectivization as the decisive factor in the impressive growth of this period (Bramall, 1993).

Since then, the decollectivization has escalated with successive phases upholding individual land contracts, such that residual powers of communal land management have been increasingly hollowed out. Indeed, the goal of privatization has even superseded one of the defining characteristics of the transition in land rights in China, namely the redistribution of land to accommodate new demographic realities and reduce landholding inequality. The Central Committee of the Communist Party of China (1993) proposed maintaining consistent land allocation regardless of changes in household population ("*zeng ren bu zeng di, jian ren bu jian di*"). This principle, applied during the second period of land contract reforms (from 1997), dictated that villages should refrain from making land redistributions for demographic changes.

With increasing rural–urban migration, the state has developed policies to provide peasants with existing land rights in their rural hometowns, offering various protections and promoting individual transactions of farmland use rights. The Law of the People's Republic of China on Land Contract in Rural Areas (2002) acknowledged the legality of the market transfer of rural land. The Central Committee of the Communist Party of China (2014) stipulated that villages should not appropriate peasants' revenue from land transfers. This directive emphasized that the decision regarding land transfer, including its pricing and terms, should be determined by the individual peasant households.

A critical requirement for encouraging individual responsibility and market transactions was clarification of rural land records and titling. Under communal management, village-level land records were more fluid, responding to occasional land redistribution events, which later became a hindrance to precise market transactions of land. Therefore, the Ministry of Agriculture and Rural Affairs (2011) prioritized precise measurements of peasants' land, set up a land use rights registry, and certified these rights at the individual level. Perhaps due to the urgency of the task, it took only five years to complete the work of surveying, registering, and certifying peasants' land use rights, starting in 2013 (Central Committee of the Communist Party of China, 2013).

The promotion of individual land rights has occurred in the context of widening efforts to reshape peasants into individual rather than communal agents. Most prominently, this was initiated by the central government abolishing agricultural taxes (and informal fees) after January 1, 2006 (China Xinhua News, 2009). The subsequent Rural Tax Reform (RTR), a significant development in rural governance, abolished the use of compulsory labor in rural areas, implemented direct subsidies to peasants, and enacted other measures to alleviate the financial burden on peasants. Although the abolition of agricultural taxes has been largely supported by peasants, it has engendered communal problems, such as the neglect of rural public goods due to lack of community labor and a decline of village-level governance due to the lack of tax support. Zhao (2010) pointed out that the RTR caused villages to withdraw from the overall management of rural public goods and peasants to step away from the cooperative supply of public goods such as irrigation systems. Tian and Chen (2010) indicated that after the RTR, the direct connection between state power and peasants gradually increased, which in turn, weakened the local grassroots governance.

Following the progression of these policies, as shown in Table 1, a discernible trend emerged of empowering individual land rights at the cost of common property management in China. According to government documents and existing studies on individual land tenure (Gao et al., 2017; Li et al., 2021; Qin et al., 2011; Qiu et al., 2021; Q. Zhang, 2022), the rationale behind these policies is (a) to protect peasants' interests and encourage production and (b) to facilitate market transactions of land

and reduce transaction costs by ensuring clear and stable land rights. This study casts doubt on this rationality and the underlying behavioral assumptions through in-depth research. Through qualitative methods, a survey on land management and peasants' livelihoods in Anhui province was conducted. The results demonstrated numerous cases that refuted the simplistic narrative that stabilizing peasants' individual land rights achieves efficient outcomes for rural development and agricultural promotion.

Research Methods and Study Area

The research was conducted in Huashi[3] administrative village under the jurisdiction of Chuzhou City in the southeastern part of Anhui province, near the area bordering Jiangsu province, from December 2020 to January 2021. Anhui province and particularly Chuzhou are appropriate case studies for studying rural land rights as they have experienced a considerable outflow of migrants. At the end of 2022, the registered population[4] of Chuzhou was 4.54 million, while the number of permanent residents was 4.05 million, which indicates an outflow of close to 500,000 people (Statistics Bureau of Chuzhou City, 2023).

Due to the outbreak of COVID-19 and initiation of lockdown policy in January 2020, direct fieldwork was interrupted. However, as no positive cases were reported in the county where Huashi is located, the county government permitted residents to move freely while wearing masks, provided they recorded their whereabouts using their mobile phones. After confirming my eligibility, I obtained approval from the village committee of Huashi to conduct face-to-face research in the village.

As an administrative village, Huashi governs 31 villager groups (natural villages), including 15 groups that were dissolved in village resettlement projects introduced by the government.[5] The registered population in 2021 was approximately 4,000 people, comprising approximately 1,300 households. The registered population of each villager group ranges from 80 to 160 (20 to 40 households). The resident population represents over half of the registered population according to the village committee of Huashi. The land ownership is nominally vested in the villager groups, as opposed to the Huashi administrative village. Each villager group owns 400 to 1,000 mǔ[6] (66–

Table 1. Policies that Strengthened Individual Land Rights of Peasants

Period	Rural policies
1978	HRS extended nationwide; peasants have been endowed with land use rights while villages still own land
1993	Inception of the principle of maintaining consistent land allocation regardless of changes in household population
1997	Start of the second land contract period (30 years)
2002	Transfers of land contracted by peasants are permitted
Early 2000s	Commencement of RTR favoring direct peasant–state interaction over communal governance
2013–2018	Land surveying and registration of individual land rights
2017	State intention to renew the second round of land contract period for another 30 years

[3] The name of the village is a pseudonym.

[4] The registered population refers to individuals whose household registration (hukou, as illustrated in footnote 7) is located in Chuzhou.

[5] In recent years, China has witnessed widespread government-led village demolition and resettlement projects, which involve the demolition of rural homes, with the reclaimed land repurposed for urban economic development, or to compensate for insufficient arable land. Residents from these demolished areas are relocated to more urbanized environments, facilitated by government provisions. This approach is also anticipated to effectively increase urbanization rates.

[6] Mǔ (亩) is a traditional unit of land measurement used in China. Typically, one mǔ is equivalent to approximately one-sixth of an acre or 666.67 square meters. However, the definition of mǔ can vary across regions in China. In Chuzhou, for example, there is a local variation where one mǔ is equal to approximately 1,000 square meters. In this article, the unit mǔ is used in the standard sense (666.67 m2). For conversion: 1 mǔ = 0.165 acre = 0.067 ha; 6.07 mǔ = 1 acre = 0.405 ha; and 15 mǔ = 2.47 acres = 1 ha.

165 acres or 27–67 hectares) of arable land, mostly made of paddy fields, with the main crops being rice, wheat, and rapeseed. As some villager groups are geographically distant, and some of them were already slated for demolition, the survey was conducted in three adjacent villager groups in Huashi that have not yet been earmarked for demolition: Groups D, G, and Y. To understand the trends, questionnaires were utilized (see Appendix), and the research was deepened through open-ended interviews with both the villagers and leaders of the villager groups.

Over these two months, I made frequent visits to the villager groups, ranging from three to five times a week. The local custom is to keep yard doors open as a sign of someone being at home, and it was possible for me to enter their homes and strike up conversations with them in the local dialect. The majority of the villagers were more than willing to share information with me regarding land rights issues, and some even offered to introduce me to their neighbors to confirm various points. When it came to vacant houses, I verified with the villagers whether these homes had been unoccupied for an extended period or were temporarily vacant, to faithfully record the number of permanent residents. After primary fieldwork ended in January 2021, I made four follow-up visits to Huashi after the lockdown measures were eased. Furthermore, after my departure from Chuzhou, I supplemented the survey data by conducting telephone interviews.

The questionnaire survey included questions on the composition of household members and their employment status (population, gender, age, status of residence in the village, rural household registration, occupation, and income). The survey also asked about agricultural operation status (transferred land area, operated land area, agricultural output) and contacts between the out-migrant population and the village (residence status of out-migrants, frequency of returning to the village, participation in agricultural operation, participation in village public affairs). The open-ended interviews further provided in-depth data, including insights into land transactions between the resident villagers and non-local farmers, the agricultural practices employed by villagers and their approach to handling harvests, civic activities in the era since the Rural Tax Reform, and the perspective of residents regarding the future of the village.

Results

An important prerequisite of this analysis was determining the on-the-ground reality of out-migration and the extent to which it diverges from official statistics. The resident population in this paper refers to individuals who live in the village for more than six months out of a year; others are referred to as the out-migrant population. When surveyed directly, the actual population outflow exceeded the account of the village committees significantly, sometimes even diametrically. Based on the information provided by the leaders of the three groups, Group D, Group G, and Group Y have registered populations of 118, 120, and 85, respectively. Compared to the resident population enumerated in this research (see Table 2), the population loss rates for these villager groups stand at 78%, 75%, and 75%, respectively. Even direct observations in the field (Table 2) could not account for the full out-migrant population of these villager groups because over half of the houses remain unoccupied (and therefore, incalculable) throughout the year. This significant out-migrant population, and its imprecision, may be attributed to the geographical proximity of these villager groups to the town's main road, as they are

Table 2. Resident Population and Out-Migrant Population

Group	Resident population	Out-migrant population	Total	Number of households
D	26	36	62	13
G	30	45	75	15
Y	21	20	41	9
Total	77	101	178	37

located only about 3 to 6 miles (5–10 km) from the town's industrial parks, commercial centers, and urban residential areas. Many people have relocated to the town.

An important consideration when enumerating out-migration is understanding how the peculiarities of the Chinese household registration system (*hukou*) impact bureaucratically defined versus actual residence.[7] Households in this survey are defined as units of people whose hukou belongs to or had previously belonged to a shared household, and who have lived together for a certain period. Relatives, such as children, parents, and grandchildren, who may no longer live together but did in the past, still have strong ties to each other, and are financially codependent, were also counted as household members, regardless of whether they are currently registered in the same hukou. Thirty-seven households were surveyed; the resident population of these households was 77 while the out-migrant population was 101. Understanding the impact of this scope of out-migration on land use is a critical issue.

Income and Demographic Trends of Out-migrants

The survey results indicate that the predominant holders of rural land are actually the out-migrant population, while household members who remain in the village are often compelled to lease out their land in accordance with the preferences of their urban household members. These out-migrants, who make up the majority of the officially registered population in the village, retain their rural hukou and associated rural land rights despite working and living in urban areas. It is worth noting that, in accordance with existing policies and laws, the villager group lacks the authority to request the return of such land.

As shown in Table 3, young and highly educated individuals have largely left the village, found employment in nonagricultural sectors, and achieved higher income levels. The mean and median incomes in Table 3 refer to the mean and median per capita annual family incomes. The per capita family income was calculated by dividing the total annual income of the family by the total number of family members (including nonearning minors and elderly people). The incomes of the out-migrant population and their household members living in the village (the resident population) were calculated separately for comparison purposes. This also facilitates comparison with the urban population. While the annual per-capita disposable income of urban residents in Chuzhou in 2022 was 41,043 CNY (US$5,574; Statistics Bureau of Chuzhou City, 2023), the income of some out-migrants exceeded this number. Despite achieving parity or surpassing urban income standards, most out-migrants have chosen to maintain their original rural hukou. Only three individuals switched to urban hukou. This pattern of behavior has strategic considerations for land use and implications for rural governance, which will be discussed further below.

A further explanation for the high proportion of out-migrants in the village is the gender disparity in migration. It remains common for one partner to migrate; in the study area, the trend diverges from the national trend of male-dominated migration from rural areas.[8] In contrast, it was observed in each group that men were more likely to remain

[7] The current household registration system (*hukou*) in China was founded in the 1950s to designate Chinese citizens as permanent residents of specific regions. After undergoing various reforms, hukou no longer primarily serves as a tool for restricting population migration, but it remains complex and challenging to exchange a person's hukou due to its implications for social welfare benefits. One crucial feature of hukou is its inheritability, meaning that it is passed down to an individual's offspring. Consequently, it is common for an individual's hukou registration and their current residence to be incongruent. Nowadays, hukou still maintains a rural–urban dual structure, which classifies Chinese citizens into two categorizations: agricultural (known as rural hukou) and non-agricultural (known as urban hukou). The rural hukou is closely linked to access to rural land rights. In the context of this study, for example, regardless of whether an individual resides in an urban or rural area, possessing a rural hukou remain the only condition for enjoying rights to local rural land.

[8] Since the 1980s, the phenomenon of left-behind women has become increasingly permanent in China. As the government has eased its control over rural–urban migrations, many men have relocated to urban areas in search of work, leaving their wives behind in rural

in the village, while women were more likely to migrate. This trend might be explained by the tradition that elderly women often join their children's homes in urban areas to help take care of the grandchildren, while their husbands remain in the village. The mobility of women, children, and grandparents to urban areas can also explain the high proportion of out-migrants in this sample.

Table 3. Basic Information of Registered Population in Three Villager Groups

		D		G		Y		Total	
		RP[a]	OP[b]	RP	OP	RP	OP	RP	OP
Age	Mean	58.88	33	63.17	33.29	52.62	35.7	58.84	33.66
	Median	63	35	65.5	32	52	34.5	59	34
Gender	Female	12	18	13	25	10	12	35	55
	Male	14	18	17	20	11	8	42	46
Education	Elementary education and below	19	5	23	14	9	10	51	29
	Between elementary and high school graduation	7	17	7	29	9	8	23	54
	College education and higher	0	8	0	2	3	2	3	12
	Missing value[c]		6						
Hukou	Rural hukou	26	29	30	43	21	20	77	92
	Urban hukou	0	1	0	2	0	0	0	3
	Missing value		6						
Farming	Self-consumption[d]	21	0	19	0	3	1	43	1
	Employment[e]	1	0	4	0	10	0	15	0
	Never farmed	4	36	7	45	8	19	19	100
Annual income (USD)	Mean	2,683	12,948	2,283	2,891	3,065	10,127	2,677	8,655
	Median	2,342	7,230	1,377	3,386	2,597	8,371	1,989	4,091

[a] "RP" refers to the resident population.
[b] "OP" refers to the out-migrant population.
[c] There was one household whose members were coincidently not at home during the in-person survey. Their basic information was obtained through a call to their relatives in Group D, but accurate information on their education and hukou was not obtained, which resulted in 6 missing values in Group D.
[d] Farming for self-consumption means that more than half of agricultural output is consumed by the household members (including as food or as gifts to others).
[e] Farming for employment indicates that more than half of the agricultural output is sold.

Agriculture remains an essential part of the lives of the resident population, with 75% still involved in farming, although only 20% regard it as their main source of income. This is discussed in detail in the next section.

Agricultural Operations

The majority of the agricultural land rights of the three groups have, to some extent, been transferred to several individuals for large-scale operations (see

areas to care for their children and elderly parents. In the context of Huashi village, the dynamic has shifted as younger generations have increasingly migrated to urban areas. In the new scenario, young women have also begun working in the cities. Meanwhile, older women have moved with their children to undertake domestic work, which has left older men to live alone in the village.

Table 4. Large-scale Agricultural Operations in the Three Groups

Group	Farmer	Land area	Price	Main produce
D	Farmer 1	160 mǔ (26 acres)	250 CNY/mǔ (US$211/acre)	rice, wheat, maize
	Farmer 2 (nonlocal)	300 mǔ (49 acres)	400 CNY/mǔ (US$339/acre)	rice, wheat
G	Farmer 3 (nonlocal)	515 mǔ (85 acres)	430 CNY/mǔ (US$364/acre)	rice, wheat
Y	Farmer 4 (group leader)	150 mǔ (25 acres)	350 CNY/mǔ (US$296/acre)	rice, wheat, maize
Y	Farmer 5	200 mǔ (33 acres)	350 CNY/mǔ (US$296/acre)	rice, wheat, maize, rapeseed

Figure 1. Villagers Were Drying Locally Sourced Meat to Produce Traditional Bacon

Photo taken on December 25, 2020, by the author.

Table 4), but with mixed outcomes. Indicative of this, within Groups D and G, most of the land has been leased to nonlocal farmers and external companies from regions beyond Chuzhou since 2010. As reported by residents in these groups, leasing the land has not resulted in better cultivation practices. In fact, it is common for tenants to leave the land uncultivated. Because external entities approach land management from a profit-driven perspective, calculating inputs and outputs meticulously, if the land does not yield a profit, they stop farming. In contrast, the resident population often operates under a different mindset: they do not strictly factor their labor into the cost equation, and a portion of the land's output serves as a food source for themselves and their urban-dwelling offspring. The remainder can be used as feed for poultry and livestock, providing them with a fresh source of meat (see Figure 1). Any surplus can be sold to local grain traders, farmers markets, or restaurants.

The large proportion of agricultural land leases implies that villager groups do not have the willingness or capacity to farm all the land they have available, an assumption that is not directly borne out by this study. Households commonly managed a vegetable garden of about 0.2 mǔ (0.03 acres or 0.01 ha; see Figure 2) and raised chickens, ducks, geese, pigs, and fish. Some villagers retained 0.5–1 mǔ to farm rice for daily consumption (e.g., Case 1 below). Such households were classified as farming for self-consumption in Table 3. In many cases, more land could be farmed under the resources of the resident population, as some local farmers continue to do (such as in Group Y). However, 74% of the farmland in Group D and all farmland in Group G has been leased, primarily to external actors. According to their reports, the transfer of land rights in Groups D and G is primarily due to the desire of out-migrants, who collectively make up about 75% of the population. Those who stay in the village (who are often elderly) are compelled to follow the decision of their children in urban

areas. Some of the resident population have shown their dissatisfaction with the situation by clearing abandoned land to grow grains for self-sufficiency and to keep busy (e.g., Case 2).

In particular, external lessees have often failed to manage the land properly and/or did not keep their contracts. This has led some residents to claw their land back (see Figure 3). Few outsiders have been able to maintain their ventures for more than three years. According to their explanation, this is because the rising costs of land rent and agricultural labor prices make it difficult for them to profit. In the case of Farmer 2, predicting a financial loss, he had left the land idle and refused to pay rent to the villagers since 2020. Subsequently, some residents in Group D began to farm their land after they stopped receiving their rent (e.g., Case 3). Nevertheless, local farmers (Farmers 1, 4, and 5) have not experienced this loss. This could be attributed to their ability to lease land inexpensively through local connections, as well as the fact that operations under 200 mǔ demand minimal labor.

All land of Group Y is cultivated by the resident population and has never been transferred to nonlocals. The leader (Farmer 4) and another villager (Farmer 5) from Group Y farmed 150 mǔ and 200 mǔ of land, respectively. The out-migrant households in Group Y leased their land to the two farmers, while the resident population cultivated the land around their households (e.g., Case 4).

Figure 2. A Vegetable Garden in Group D

Photo taken on December 24, 2020, by the author.

Figure 3. Villagers Were Reclaiming their Land from Nonlocal Farmers for Vegetable Cultivation

Photo taken on December 25, 2020, by the author.

Case Studies

The trends emerging from the survey of the village revealed not only the large extent of out-migration but also the concomitant scope of land rentals. To understand whether the land rental market lives up to the claims of proponents and the aspirations of government policy of land rights privatization, it is helpful to explore the range of outcomes. An indicative range of the dynamics is captured below in four case studies.

Case 1—Retaining land for self-consumption

Household 1, belonging to Group D, comprises five people: a 74-year-old father, 71-year-old mother, 49-year-old eldest son, 47-year-old second son, and 44-year-old daughter. The father and mother lived in the village, the second son and daughter lived in the county, and the eldest son lived in Jiangsu province. The household had a total of 11.6 mǔ of land, including 10 mǔ of paddy fields and 1.6 mǔ of dry fields. In 2019, 8.6 mǔ of the paddy fields and all of the dry fields were rented out to Farmer 2 at 400 CNY/mǔ (US$339/acre), while the remaining 1.4 mǔ of paddy fields were farmed by the mother and father. The retained paddy field could produce approximately 2,205 pounds (1,000 kg) of rice a year, which is sufficient to feed the parents and raise chickens, as well as send some to their children.

Case 2—Clearing abandoned land

Household 2 belongs to Group G and includes a 76-year-old father, 70-year-old mother, 46-year-old daughter, 43-year-old son, 22- and 18-year-old granddaughters, and a 13-year-old grandson. The father and mother lived in the village, and the son and his children lived in town, while the daughter and her child lived in the county. The household had 12 mǔ of land, including 11 mǔ of paddy fields and 1 mǔ of dry fields, which were all transferred to Farmer 3 in 2017. Although the mother was elderly, she still worked on a nearby chicken farm, where she earned approximately 10,000 CNY (US$1,410) per year. The father had a few chronic diseases and was not fit for formal employment. In 2020, the father cleared a 0.5 mǔ of abandoned land to plant some wheat and sweet potatoes, in order to "have something to do."

Case 3—Re-appropriation of underutilized rental land

Household 3 belongs to Group D, which includes a 55-year-old father, 56-year-old mother, and 29-year-old son, all living in the village, although the father and son commute to town for work daily. The household had 16 mǔ of land, including 13 mǔ of paddy fields and 3 mǔ of dry fields. Although all 16 mǔ of the land was leased to Farmer 2, the mother planted some crops on the land in 2020 after Farmer 2 left it idle and did not pay the rent. The mother stated that she thought it would be wasteful to leave the land idle; she was planning to take the land back eventually.

Case 4—Self-commercialization and self-sufficiency

Household 4 in Group Y includes a 53-year-old father, 51-year-old mother, 32-year-old son, 31-year-old daughter-in-law, and 95-year-old grandmother, with all five living in the village. The father, son, and daughter-in-law commuted to town for work. The household had 20 mǔ of land, with 15 mǔ of paddy fields and 5 mǔ of dry fields. The land was farmed by the mother and the father. The household harvested 13,228 pounds (6,000 kg) of rice, 3,307 pounds (1,500 kg) of wheat, 331 pounds (150 kg) of rapeseed, 2,205 pounds (1,000 kg) of sweet potatoes, and 110 pounds (50 kg) of maize in 2020. Of this, 11,023 pounds (5,000 kg) of rice was sold to a local grain trader at 2.4 CNY/kg (0.15 US$/pound) in 2020, while the rest was used for self-consumption, as feed for the poultry and livestock, and as gifts for relatives and friends.

Interaction Between the Out-Migrant Population and Huashi Village

The level of villager engagement in local governance of the three groups is strikingly low, partially as a consequence of the significant proportion of absentee residents and the heavy dependence of local governance on financial support from higher-level authorities. The overhaul of RTR shifted the funding source for village-level governance from local taxes to state funding. Since then, there have been minimal civic activities that require the active participation of villagers. One of the few exceptions is the election of the village committee every three years. Despite the relative proximity of many out-migrants and occasional visits to their

rural households, they often exhibit apathy toward village elections and rarely participate in local social activities. Most local residents do not perceive a sense of vitality or a promising future for the village; in fact, many express a desire for the government to demolish the village and resettle them in urban areas. This perception is exacerbated by the prevalence of dilapidated houses and poorly managed public facilities in the village. (See Figures 4 and 5.) The exception is Group Y (the village with no land rentals to outsiders), where the out-migrant population maintains stronger connections to the villagers, and the residents exhibit a higher level of resistance to village demolition. This sentiment may stem from the fact that a more significant portion of Group Y's resident population relies on agriculture as their primary source of livelihood and has continued their occupation despite the possibility of land rental (Figure 6).

Figure 4. A Dilapidated House in Group G

Photo taken on February 10, 2021, by the author.

Figure 5. An Unmanaged Pond in Group D

Photo taken on January 29, 2021, by the author.

Table 5 summarizes the factors explaining urban–rural interaction, including the distance between the out-migrant population and Huashi village, their current residence, and their frequency of returning to the village. The majority of the out-migrant population lives no farther than 15 km (9.3 miles) from the village, and most of them choose to live within the town or county. Approximately 34% of the out-migrant population was able to go back to the village once a week, while an additional 16% of them were able to return once a month.

The results of a further assessment of civic participation indicate that associated out-migrants with more physical connection to the land (due to farming or rental within the villager group) are

more likely to participate. The resident population answered questions regarding the participation of out-migrants in civic and private activities, such as management of farmland, the village committee and the group leader election, and organization of weddings and funerals. The responses were recorded by the household as a unit rather than by individuals (see Table 6). Villagers were asked, "If you are unable to continue farming the land for various reasons, to whom would you transfer the farmland?" Nearly all households in Groups G and D believed that their children would not take over the management of the land in the future, and the majority preferred transferring the land to someone who could pay high rent. In contrast, more than half of the respondents in Group Y preferred to transfer their land to their children or neighbors.

Figure 6. Meticulously Maintained Land in Group Y

Photo taken on January 18, 2021, by the author.

Regarding the question of whether out-migrants vote in elections for the group leader and the village committee, around half of the respondents in Group D and more than half of the respondents in Group G said that out-migrants entrusted their voting rights to their household members living in the village and were not interested in the

Table 5. The Current Residence of the Out-Migrant Population and their Frequency of Return

		Number of the out-migrants			
		D	G	Y	Total
Distance	Less than 15 km (9.3 miles)	27	39	15	81
	15–30 km (9.3–18.6 mi)	5	2	2	9
	30–100 km (18.6–62 mi)	2	1	0	3
	More than 100 km (62 mi)	2	3	3	8
Residence	The town	3	21	7	31
	The county	24	18	7	49
	Chuzhou City	5	2	2	9
	Anhui Province	0	0	1	1
	Jiangsu Province	3	3	1	7
	Shanghai	1	0	2	3
	Shandong Province	0	1	0	1
Frequency of return	Once a week	11	13	10	34
	Once a month	9	7	0	16
	Every half a year	8	18	3	29
	Once a year	8	7	7	22

decision. Contrastingly, more than half of the respondents in Group Y answered that the out-migrants cast their votes based on their own judgment.

In terms of social events, among all three villager groups, approximately half of the out-migrant population did not participate in any village social events, while the other half indicated that they attended some events depending on the situation. The last question asked whether the respondent would approve of the villager group being dissolved and resettled by the government, similar to the 15 groups previously split in the administrative village. Group D and G were unsure about or approving of the dissolution, while Group Y was predominantly against it.

Discussion

According to this survey conducted in three natural villages in the Huashi administrative village, the arguments put forth by recent policies in favor of strengthening individual land rights for peasants do not align with the behavior or outcomes in reality. These policies aim to safeguard the interests of peasants and promote the market transaction of land use rights to enhance the efficient utilization of land resources. However, in many cases, the consequences of the land rights trade are diametrically opposed to the goals (e.g., in terms of productivity) or are more complex than theory would dictate (e.g., in terms of village governance). An important starting point in understanding these outcomes is investigating how the identity politics of rural peasants diverges from the bureaucratic system of household registration (hukou).

In examining the protection of peasants' interests, it is important to note that the question of who is a "peasant" (*nongmin*) in the Chinese context has historically been the source of heated debates. In the legal/ administrative dimension, the identification of peasants is often oversimplified. In Chinese laws and policy documents, the term "peasants" generally refers to the holder of an agricultural hukou (Schneider, 2015). This identification ignores some important characteristics of peasants, such as the use of households as units of production and the noncommodified production of value in the households (Q. F. Zhang & Donaldson, 2010). This situation leads to intricate repercussions. If hukou is used as the standard to delineate who qualifies as a peasant in the current context, it invariably includes a diverse group of individuals, many of whom are not involved in agriculture or in rural areas at all. Some individuals, for example, reside in urban areas and have never been involved in agricultural activities, yet they possess a rural hukou, which classifies them as part of the peasant group and grants them rural land rights according to laws and regulations. Examining the data from the three villager groups in Huashi, these so-called peasants in urban areas have shifted away from agricultural pursuits. Their income levels are on par with or

Table 6. Participation of the Out-Migrant Population in Village Affairs and Social Activities

	Number of households			
	D	G	Y	Total
Land management				
My child (children)	0	0	3	3
Relatives	1	0	0	1
Neighbors	2	0	1	3
Anyone who can offer high rent	9	14	3	26
Missing value[a]	1	1	2	4
Participation in elections				
Yes	6	3	6	15
No	7	12	3	22
Social events				
Depending on the situation	5	7	5	17
Never	8	8	4	20
The demolition of the village				
Oppose	4	3	5	12
Approve	4	7	2	13
Unsure	5	5	2	12

[a] Missing values arose in 4 households, which reported never considering the issue thoroughly.

even surpass the average income of urban residents. However, due to their control over a substantial portion of rural land, the voice of the "authentic peasants" living in the village has been diminished.

This is well illustrated in the case study of Huashi village, which reveals that the economic growth in nearby towns and cities has created non-agricultural employment opportunities for rural people, but simultaneously hollowed out civic participation and other rural maintenance activities, including farming, social activities, elections, and local governance. Furthermore, RTR has exacerbated this situation, as villages have ceased to rely on funds from local villagers for exercising administrative power. This shift has resulted in village-level governance becoming more accountable to the state rather than to local residents. As the towns have experienced increasing prosperity and vibrancy, rural areas, in contrast, have faced crumbling infrastructure and an isolated elderly population. Villagers have become disillusioned with the deteriorating and desolate state of their villages, perpetuating a downward spiral in local engagement. In some cases, villagers even hoped for government-led demolitions and relocation to urban areas. In this context, leasing one's land for profit while alienating oneself from the rural area that afforded the land rights in the first place (i.e., the rural hukou) presents an unfortunate logic.

Considering the potential social costs of wide-scale rural land privatization, does it at least really result in a more efficient utilization of land resources? Examining the experiences of Group D and Group G in Huashi reveals that large-scale agricultural producers adhere to the logic of capitalist production. They cease their operations as soon as land becomes unprofitable for them, leaving land unsightly and idle, or in some cases refuse to pay rent. For peasants living in Huashi, observing idle land that could supplement incomes or provide for self-sufficiency is a painful daily reminder of the hollowing out of rural land management. Out-migrants who visit irregularly or do not maintain meaningful social ties are, naturally, less bothered by the wasteful agricultural decline in their hometowns. To resident villagers, land carries a significance that extends beyond being a mere commodity or a means of production; it represents a resource through which they secure sustenance, reproduce the landscape, and encounter a profound sense of life. To some extent, this was revealed in the experiences of Group Y, which maintained more independent farmers, did not lease land to external agents, and did not face nearly the same extent of abandoned land, political disaffection, or loss of civic engagement. The food produced by resident peasants has not only helped ensure their own food security, especially during the COVID-19 lockdown, but also provided sustenance for their urban relatives. In addition, surplus food is sold at local markets or makes its way to the urban population. Such outcomes were less common in village groups, in which out-migrants instrumentalized their rural land to rent to external entities who had little accountability to the rural economy, landscape, or civic affairs.

Conclusions and Policy Recommendations

In the prevailing global capital-driven agricultural and food systems, traditional rural commons such as communal land, forests, and pastures are on the decline. Given the widespread adoption of market liberalization, future research must explore methods of advancing democratic governance within rural communities and pioneering novel approaches to harnessing commons through local initiatives. This is essential for revitalizing commons within diverse market economies, collectively addressing the challenges posed by the capitalization of agri-food systems on rural commons.

To this end, this paper reviews the ongoing debate surrounding the privatization of rural land in China and reexamines the distinctions between private and common property. I stress the notion that the common property is not "everyone's property"; rather, it should be equitably utilized within a certain group. Tracing the historical evolution of China's rural land policy reveals two primary motivations for enhancing individual land rights for peasants: safeguarding peasants' interests to stimulate their enthusiasm for production and facilitating land market transactions to optimize land resource utilization.

As discussed above, the theoretical justifications for strengthening individual land rights for

peasants scarcely match the on-the-ground experiences of Huashi village. This is because a significant portion of the rural land is now controlled by individuals who have migrated to urban areas. They have often carelessly leased their land to the highest bidder, despite the invariable consequences of a capitalist mode of operation that fails to achieve resource efficiency in absolute terms or by the standards of the previously peasant-driven agricultural systems. By 2022, 295.62 million people in China had transitioned from rural areas to urban settings, marking an increase of 3.11 million compared to 2021(National Bureau of Statistics, 2023). With the ongoing rural–urban migration, it becomes essential to explore ways in which rural governance can be maintained and land resources can be continuously utilized. This study reveals that the escalating privatization of land has not pointed in this direction. The case of Group Y, which avoided some of the pitfalls of privatization and maintained stronger social and civic ties, may offer some clues as to such a formulation.

In this regard, this paper aligns with the position that some aspects of land privatization have hamstrung local governance in Chinese villages. This suggests that local governance should remain empowered to modify the distribution of rural land to optimize land use and support local food security, particularly if absentee land rights holders do not take their rural responsibilities seriously. First, this approach can help avert the situation described in this article, wherein urban migrants control the majority of the land but are no longer engaged in agriculture or interested in local governance. Second, communal management encourages the recognition that land has significant symbolic value in rural life. Through their diligent efforts in cultivating the land, peasants not only sustain themselves with a rich array of nourishing food but also contribute to the well-being of urban residents by fostering family connections and supplying local markets with fresh and wholesome produce. Finally, a portion of profits from communal land can be directed toward the upkeep of shared agricultural machinery, irrigation systems, road maintenance, communal facilities, and cultural activities—all of which keep economic and civic life moving. This can enhance the bond between villages and their inhabitants in the post–Rural Tax Reform era, in which such communal engagements have become increasingly optional.

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Appendix

Questionnaire on Population Mobility and Dynamics of Rural Farmland Management

Questionnaire No.: _____

Since the 1980s, China has experienced increasing rural-to-urban migration, rapid urbanization, and robust economic growth. This questionnaire survey aims to grasp the impact of population mobility on village management and land operation, to support relevant research topics and policy decisions. The data collected through the questionnaire will be used exclusively for related research. Thank you for your cooperation and support!

Address:

- Province
- City
- County
- Township
- Administrative village
- Villager group

Part 1: Household Characteristics

1. **Composition of Household Members and Employment Situation**

		1	2	3	4	5	6	7
Relationship with the Head of the Household[a]	1 Head of Household 2 Head of Household's Spouse 3 Head of Household's Daughter 4 Head of Household's Son 5 Head of Household's Daughter-in-Law 6 Head of Household's Son-in-Law 7 Head of Household's Grandchild 8 Other Member							
Who permanently resides in the village?	1 Head of Household 2 Head of Household's Spouse 3 Head of Household's Daughter 4 Head of Household's Son 5 Head of Household's Daughter-in-Law 6 Head of Household's Son-in-Law 7 Head of Household's Grandchild 8 Other Household Member							
Gender	1 Female 2 Male							
Age								
Current Hukou	1 Rural hukou 2 Urban hukou							
Is he/she the single child? [b]	1 Yes 2 No							
Education	1 Elementary education and below 2. Junior school 3. High school 4. College education 5. Postgraduate education and higher							

Employment	Agriculture	How many days does he/she work within a year?								
		Annual Income (CNY)								
	Non-agricultural sectors	Business Owner or Formal Employee	How many days does he/she work within a year?							
			Annual Income (CNY)							
		Informal Employee	How many days does he/she work within a year?							
			Annual Income (CNY)							
		Does he/she engage in farming activities?	1 Yes 2 No							
Is he/she a cadre in the village committee or the village group leader?		1 Yes 2 No								

[a] In hukou system, each household has a designated head, typically a married male.

[b] The single child refers to an individual who is without any siblings, a circumstance that may include those affected by the one-child policy implemented in China since the 1980s.

Part 2: Farmland Operation

2. Size of Farmland Operated

Paddy fields ____ mǔ (Allocated area ___ mǔ；Leased in ___ mǔ; Leased out ___ mǔ)

Dry fields ____ mǔ (Allocated area ___ mǔ; Leased in ___ mǔ; Leased out ___ mǔ)

Mountain ___ mǔ (Allocated area ___ mǔ; Leased in ___ mǔ; Leased out ___ mǔ)

Water ___ mǔ (Allocated area ___ mǔ; Leased in ___ mǔ; Leased out ___ mǔ)

Other

3. Input and Output in Agriculture

Crops	Sowing Time (Lunar Month)	Planting area (mu)	Labor	Investment (CNY)									Total Yield (jin[a])	Sales (jin)	Selling Price (CNY/jin)	Self-consumption (jin)
				Land Rent	Hiring Workers	Seeds	Chemical Fertilizers	Pesticides	Machinery Operations	Electricity	Plastic Mulch	Other				
Wheat																
Rice																
Rapeseed																
Cotton																
Corn																
Soybean																
Peanut																
Vegetables and Fruits																
Other																
Total Input																

[a] One jin is approximately equivalent to 0.5 kg, 1.1 lbs.

4. Do you use homemade farm compost (homemade compost: self-made fertilizer produced by fermenting manure, plant materials, etc.)?

① Yes, I use. ② No, I do not use.

5. Have you purchased large agricultural machinery?

① Yes (with details about the price and the year of purchase)

Tractor: _____ CNY (year of purchase _____)

Seeder: _____ CNY (year of purchase _____)

Thresher: _____ CNY (year of purchase _____)

Harvester: _____ CNY (year of purchase _____)

Dryer: _____ CNY (year of purchase _____)

Water Pump: _____ CNY (year of purchase _____)

Corn Thresher: _____ CNY (year of purchase _____)

Other Agricultural Machinery: _____ CNY (year of purchase _____)

② No

Part 3: Interaction Between the Out-migrants and the Village

6. If you were unable to continue farming the land for various reasons, to whom would you transfer the farmland?

① My child(ren) (child(ren)'s age ____, residing in A rural/ B urban）

② Relatives in the village

③ Neighbors in the village

④ Whoever offers a higher rent, including non-local farmers and external companies.

⑤ Other (e.g., _____)

7. Where do your children currently reside (multiple choices allowed)?

① Rural (in the same village as you) ② Rural (in a different village)

③ Urban ④ No children

8. What is the distance between your children and your residence (multiple choices allowed)?

① Within 15 km ② 15–30 km ③ 30–60 km ④ 60–100 km ⑤ More than 100 km

9. How often do your children come back (multiple choices allowed)?

① Once a week ② Once a month ③ Once every six months

④ Once a year ⑤ Once every few years

10. Do your children come back to help during the busy farming seasons (multiple choices allowed)?

① They come back every busy farming season

② They occasionally come back to help

③ They do not come back to help

11. After China introduced the long-term and stable land use rights policy, are your children interested in managing the farmland in the village?

① Yes ② No

12. When you get older and need someone to take care of your daily life, who do you plan to have as your caregiver?

① Children take turns if you have both son(s) and daughter(s)

② Son(s) if you have both son(s) and daughter(s)

③ Son(s) if you only have son(s)

④ Daughter(s) if you only have daughter(s)

⑤ Nursing home

⑥ Not clear

⑦ Other

13. Where would you like to spend your later years?

① In your village (where your children also live in the village)

② In your village (where your children do not live in the village)

③ At your children's home (where your children do not live in the village)

④ Not clear

14. When you can no longer work to earn money, where will your retirement funds primarily come from? (multiple choices allowed)?

① By relying on my own savings, as well as the government's pension for rural elderly

② By leasing out farmland to others and using the land lease income for retirement

③ Financial support from children

④ Not clear

Part 4: Civic Participation

15. What are the activities in the village that require participation from villagers?

① Village committee elections ② Road, ditch, and other public facilities repairs

③ Distribution of grain subsidies ④ Other

16. How often does the village committee convene a village assembly?

① Once a year ② Twice a year ③ Three times a year

④ Irregularly, with ad-hoc meetings as needed

17. Do your children living in urban areas participate in village committee elections and other village affairs?

① They participate in elections but do not participate in other matters.

② They never participate in elections and other affairs.

③ They actively participate in all affairs.

④ Not clear

18. Do your children participate in wedding ceremonies and funerals in the village?

① The village has an organization to manage these events, and all villagers with local hukou, even if they work elsewhere, are required to participate.

② The village does not have specific organizations to manage these events, and their participation depends on specific situations.

③ They never participate.

④ Not clear.

19. As more young people are settling in cities, rural villages are facing increasing aging and depopulation. What are your views on the future village governance?

① I oppose demolition of rural houses and relocation.

② I support demolition and relocation; villagers can move to urban communities.

③ I have no strong preference.

The questionnaire ends here! Thank you for your cooperation!

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More than procurement: Examination of a farm-to-early-care and education pilot

Meagan K. Shedd [a] * and Rachel Kelly [b]
Michigan State University

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Abstract

Although there is a wealth of research on farm-to-school programs (FTS), less has been published about farm to early care and education programs (ECE). This paper examines the results of participating in a farm-to-ECE procurement pilot program on provider practices across the three core elements of farm to ECE: (1) purchasing, (2) gardening, and (3) nutrition and education activities. In order to address the geographic and funding constraints of an existing procurement pilot, Michigan offered an expansion of this model so that ECE sites could take part in a learning collaborative. They did this by examining the effectiveness of evidence-based practices in obtaining locally grown foods from a variety of sources among ECE sites, for statewide replication. Participation included self-assessment of learning environments using a nationally available, validated instrument to determine pre- to post-test changes in farm-to-ECE practices and what, if any, changes in practices might have occurred for those partici-

[a] * *Corresponding author*: Meagan K. Shedd, Assistant Professor, Michigan State University Center for Regional Food Systems; 480 Wilson Road, Room 309; East Lansing, MI 48824 USA; mshedd@msu.edu; https://orcid.org/0000-0003-4646-1577

[b] Rachel Kelly, Outreach Specialist, Michigan State University Center for Regional Food Systems; kellyra@msu.edu; https://orcid.org/0009-0003-9321-6133

Author Note

There are no known conflicts of interest to disclose by the authors.

Author Roles

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pating in the procurement pilot, with the goal of sharing what was learned statewide. Key findings include improvements of statistical significance from pre-test to post-test and changes in best practices among participants using Go NAPSACC, with the top three most improved practices involving garden-based practices. The role of self-assessment, funding, and limitations are discussed, along with implications for practice and further research.

Keywords
farm-to-ECE programs, early care and education, nutrition, procurement

Introduction

The integration of food, nutrition, and agriculture education, increased purchasing through local sources, and on-site gardening began in a handful of schools in the late 1990s as part of farm-to-school initiatives. This has expanded to over 75% of schools reporting serving local food and over 67,000 schools in all 50 states participating in farm to school in 2019 (U.S. Department of Agriculture [USDA], 2021).

Extant research supports benefits associated with farm-to-school (FTS) and health, education, and economic outcomes (National Farm to School Network [NFSN], 2020) and research suggests students participating in FTS are more likely to try new foods, increase consumption of fruit and vegetables, and be physically active (Joshi et al., 2008; Moss et al., 2013; Yoder et al., 2014). FTS activities may also have a positive effect on social skills, as well as school engagement and academic achievement (NFSN, 2020). However, less has been research published regarding farm to early care and education (ECE), for a variety of reasons. Among the barriers of cost, limited staff to develop and implement activities and prepare food, lack of access or knowledge of local foods, and issues with family engagement (Riemer Bopp et al., 2022d), its relatively late emergence in the early care and education setting compared with FTS results in a lack of empirical offerings. This paper aims to contribute to the body of farm-to-ECE literature in sharing the results of an evaluation of a procurement pilot for early care and education sites, determining if and how practices in supporting farm-to-ECE changed through participation in an expanded pilot program.

Background

It is important to understand the nuances of farm-to-ECE with the framework offered by FTS. This is true not only in terms of the application across sites, differences in nutritional needs, and funding availability for a younger population, but also in how the pandemic affected the ECE sector and the overlap that is created with farm-to-ECE.

Farm to Early Care and Education

Farm-to-ECE consists of the same strategies as farm to school, including specific activities to (1) increase access to nutritious, locally produced foods; (2) encourage gardening; and (3) engage in education about food, nutrition, and agriculture in early care and education settings. These three aspects are considered the "core elements" of farm-to-ECE (NFSN, 2020). Farm-to-ECE can be used across early care and education settings to help children learn where food comes from and about nutrition, which is one reason why it is appealing. Options in ECE vary, but farm-to-ECE can take place in every type of early care and education setting, including child-care centers and family child-care homes, as well as Head Start programs and preschools housed in kindergarten to twelfth grade (K-12) school districts. This is one aspect that sets farm-to-ECE apart from FTS.

Whereas in FTS, replication may be accomplished from school to school more easily, the various types of early care and education settings suggest a more nuanced approach across the three core elements identified above. Differences in enrollment, in addition to variances across states in early learning standards, invite variability in programs and implementation for farm-to-ECE. While K-12 students have minimum requirements for nutrition education each year as part of the Richard B. Russell National School Lunch and H.R. 3800 Nutrition Education Acts (Beckwith et al., n.d.), no such federal mandates exist for ECE sites. Another notable difference is the smaller purchasing volume of ECE sites compared to their K-12 counterparts (Bloom et al., 2022). Despite these challenges, there are sites committed to farm-to-ECE, with

top motivations indicated in the 2021 National Farm to Early Care and Education Provider Survey as "providing fresher or higher-quality food to children" and to "provide children with experiential learning" (Riemer Bopp et al., 2022d).

Childhood Health and Well-Being Trends

About 12 million children not enrolled in public school are in child-care (Child Care Aware of America, 2019), spending an average of 25 hours per week in care outside of the home (National Center for Education Statistics, 2016). As a result, ECE programs are in a unique position to provide high quality food as part of the learning environment for the young children in their care (Benjamin-Neelon, 2018). National data indicate that almost 25% of preschool children are overweight or obese (Ogden et al., 2016), and the state in which the pilot took place was ranked 23rd out of 50 states for obese and overweight children (Robert Wood Johnson Foundation, 2020). Although childhood obesity rates have been declining, obesity rates among preschool-aged children in the U.S. began to increase again starting in 2014 (Sanyaolu et al., 2019). Beginning in 2008, the percentage of 2- to 4-year-old children identified as obese in the state participating in the pilot Special Supplemental Nutrition Program for Women, Infants, and Children (WIC program) declined, but recently the percentages started to trend upward again, with noted increases in BMI across age groups during the pandemic (Korioth, 2021).

The Child and Adult Care Food Program (CACFP) is one mechanism for funding nutritious foods in early care and education settings. Research suggests that participating in CACFP is associated with an increased compliance with nutrition recommendations (Andreyeva et al., 2018; Andreyeva & Henderson, 2018), particularly in home-based child-care settings (Erinosho et al., 2018). It has also been shown to increase family engagement opportunities and address food security issues (Stephens et al., 2021). Additionally, CACFP can be used to purchase local fruits and vegetables, addressing a common cost barrier to serving healthy foods (Lee et al., 2022), while simultaneously increasing the nutrient density of the foods served. The 2021 National Farm to ECE Provider Survey found a statistically significant association of between sites purchasing and serving local foods and receipt of CACFP funding (Riemer Bopp et al., 2022b). However, ECE providers also shared perceived barriers of knowing how to order local items and using CACFP to purchase local foods (Riemer Bopp et al., 2022b), suggesting a further need for farm-to-ECE outreach and support.

Benefits of Farm to Early Care and Education

Although the research in FTS spans decades, peer-reviewed research in farm-to-ECE is only beginning to emerge. The available studies are promising in suggesting participation in farm-to-ECE has positive impacts, such as young children showing increased willingness to try new fruits and vegetables (Dannefer et al, 2018; Sharma et al., 2015) and increasing fruit and vegetable consumption (Carroll et al., 2011; Meinen et al., 2012; Nanney et al., 2007; Williams et al., 2014). These positive impacts can extend to families due to the implementation of farm-to-ECE, with families increasing the availability of and serving more local foods at home (Nanney et al., 2007).

Early care and education providers have long recognized the incredible importance of the first years of a child's life. Equally vital is that children develop a willingness to try new foods as they develop preferences at an early age (Shedd et al., 2018). This can set the stage for healthy eating for the rest of their lives. Although birth to age 5 is considered an optimal time for development (National Research Council & Institute of Medicine Committee on Integrating the Science of Early Childhood Development, 2000), the period of early childhood faces significant challenges. Childhood obesity poses a risk not only for health, but also for social-emotional issues, which affect learning outcomes (Hemmingson, 2018). For children who are not in high quality early care and education settings, including those with access to nutritious food, delays in cognitive, social, and emotional development can further impact school readiness (Denham et al., 2012; Halfon et al., 2012).

Impact of the Pandemic on Farm-to-ECE

At its core, farm-to-ECE brings together two seemingly disparate yet intertwined systems with

common goals (Centers for Disease Control and Prevention [CDC], 2023). Both ECE and food systems, particularly those working within them, were deeply affected by the COVID-19 pandemic. Both sectors employ "frontline workers," a subcategory of essential workers unable to fulfill their work responsibilities from home but more likely to be paid less and come from "socioeconomically disadvantaged backgrounds" (Blau et al., 2020, p. 3).

The Effect of the Pandemic on Early Care and Education

The COVID-19 pandemic disproportionately affected child care, which was considered one of the hardest-hit employment sectors during the pandemic (Banghart et al., 2022). Data from October 2022 indicated that 102,400 jobs in the early care and education sector had been lost since February 2022 (Center for the Study of Child Care Employment, 2022). A national survey of ECE providers in 2021 discovered that despite the pandemic and its effect on child care, providers were committed to implementing farm-to-ECE activities (Riemer Bopp et al., 2022a). However, the same survey found that participation was more likely to occur for white enrollees than their Black counterparts at levels of statistical significance (Riemer Bopp et al., 2022c).

An understanding of who is participating in farm-to-ECE and how they are participating is essential, as it is underscored by data reporting the pandemic did not affect local food purchasing significantly. Providers were also able to leverage funding sources such as CACFP to increase eligibility for meals and to help families access meals during school closures, although only 2% of those indicating farm-to-ECE participation reported additional grants or local food incentive funding in addition to using CACFP (Riemer Bopp et al., 2022a).

National waivers for programs such as the National School Lunch Program, School Breakfast Program, Summer Food Service Program, and the Seamless Summer Option offered congregate feeding and flexibilities for meal pick-up but were mostly aimed at K-12 children (Policy Equity Group & National Farm to School Network, 2021). Waivers in place for CACFP programs offered needed flexibility and increased access to healthy meals for children (Food Research and Action Center, 2022), but may not have addressed staffing or other financial issues for program administration (Policy Equity Group & National Farm to School Network, 2021).

The Effect of the Pandemic on the Food System

During the first year of the pandemic, over 800 meat-packaging, food-processing, and farm facilities in the U.S. were affected by COVID-19 cases (Aday & Aday, 2020). Consumer behavior and purchasing choices were affected by decreased staff in grocery stores and other food retail outlets, with reduced staff in these locations and supply-chain issues affecting the availability of products (Aday & Aday, 2020). With grocery or retail stores indicated as the first choice for local food procurement among respondents in the 2021 National Farm to ECE Provider Survey (Riemer Bopp et al., 2022b), limitations on purchases could be problematic for home-based child care providers using these options as their sole source of food purchasing.

However, as with their ECE counterparts, there are examples of farmers and food producers who worked to ensure access to local product during the pandemic. One model is the farmers and food producers who facilitated the selection and delivery of products to early care and education settings online or through "virtual farm stands," as successfully demonstrated in Iowa (Hoffman et al., 2017). Similarly, other core elements of farm-to-ECE were implemented through alternate means, including support for gardening and nutrition and agricultural education through virtual learning and virtual farm visits (CDC, 2023). At the height of the pandemic, providers who closed temporarily were able to participate virtually in professional development about farm-to-ECE and, once able to open again, to implement gardening and outdoor learning activities with young children that enabled physical distancing (NFSN, 2022). Providing food from an onsite garden during the pandemic was listed among the top four strategies reported by providers participating in the 2021 National Farm to ECE Provider Survey and was used for taste testing, nutrition education, and to supplement food purchasing (Riemer Bopp et al., 2022a). In

other words, ECE sites worked with farmers and food producers to implement all three core elements of farm-to-ECE during the pandemic.

Study Context

The Farm to Early Care and Education Implementation Grant (FIG) Procurement Pilot was funded as part of Michigan's funding opportunity through the Association for State Public Health Nutritionists (ASPHN) year 3 award. The FIG Procurement Pilot was an expansion of a pilot program established three years prior, in 2018, as a subset of grant funding from the W.K. Kellogg Foundation (Shedd, 2022). The initial farm-to-ECE pilots were created to help ECE staff in three communities in Michigan identified as high need based on social determinants of health access to obtain locally grown foods. This included sourcing directly from farmers for use in meals, snacks, and as part of their educational activities, but also accessing from farmers markets, food hubs, and distributors.

The pilots were designed to develop sourcing solutions at the local level as part of a collective local food solution based on the needs and goals of communities. Additionally, participant feedback was intended to drive and develop a shared learning collaborative, as participating sites met regularly for discussions about farm implementation strategies and training and technical assistance opportunities to address the other two core elements of gardening and nutrition and agriculture education.

The FIG Procurement Pilots were intended to expand on the existing procurement pilot by offering participation opportunities for additional early care and education sites beyond the three priority communities, including rural and underserved communities beyond the initial three priority communities. By expanding the geographic boundaries, ECE sites across the state were eligible for the funding opportunity, and also were able to take part in a learning collaborative and have access to the same support for training and technical assistance. Ultimately, what was learned would answer the questions of if and how participation in a procurement pilot could elicit changes in implementation of farm-to-ECE, with the goal of using what was learned to help inform and support statewide farm-to-ECE efforts.

Methods

The FIG Procurement Pilot mirrored the same process for participation as the original pilot. Prior to sharing information about the opportunity, the project was approved by the Michigan State University Institutional Review Board (IRB). A request for applications (RFA) was distributed through the state's Farm to Early Care and Education (ECE) Network two times (in November 2021 and February 2022), sharing the application and criteria for participation. FIG Procurement Pilot applicants were encouraged to consider all three core elements of farm-to-ECE in their applications, as well as how their proposals would address continued implementation of farm-to-ECE in their programs beyond the funding of the procurement pilot. The email announcement and RFA offered examples of how funding might be used, including but not limited to purchasing of gardening supplies such as materials for raised beds, seeds, soils, and equipment for classroom gardens, purchase of specific kitchen equipment for classroom tasting demonstrations, purchase of a community supported agriculture (CSA) membership to increase local sourcing options, and encouraging other ideas that would increase and sustain local buying capacity. Specific expectations for participation, including completion of self-assessments and participation in the learning collaborative, were also shared with the RFA announcement. Additional expectations included participating in the virtual learning collaborative to share challenges and best practices, receiving training and technical assistance regarding local food procurement, gardening, and nutrition education (with professional development credit in the provider registry system available), and having access to additional free farm-to-ECE resources either through Go NAPSACC or the monthly farm-to-ECE Procurement Pilot newsletter.

Each site completed a farm-to-ECE Go NAPSACC self-assessment and an action plan in Go NAPSACC to support its application upon award notification. This enabled the identification of baseline data regarding best practices in farm-to-ECE, as well as the creation of a guide for the implementation of farm-to-ECE practices for the provider during the pilot. Participants had access to

the online Go NAPSACC platform to view their self-assessment data in real time and could see the number of best practices met, as well as their action plan. They also had access to the online training and resources in the platform and could update their progress toward identified goals in their action plan at any time.

Each month a newsletter was sent to Procurement Pilot participants sharing specific resources for purchasing local food, gardening in early care and education settings both inside classrooms and outdoors, nutrition and agriculture education, family engagement strategies, racial equity in early care and education, and grant or funding opportunities for farm-to-ECE. An additional section enabled sites to share about implementation of farm-to-ECE at their site, encouraging "show and tell" between and among sites using an additional delivery mechanism.

Participation

Early care and education sites providing for children age five and under were eligible for participation, but participation could not be limited to only after-school care. Participation in CACFP was not a requirement, but sites received regular information regarding the program and additional technical assistance about CACFP if desired.

Participants in the FIG cohort could apply for and receive up to US$500 in subgrants. Most applicants applied for the full amount of funding, although there were a few that did not. The first expansion application was distributed in November 2021 with 20 sites applying and 20 sites funded. The second expansion application was distributed in February 2022, with 45 sites applying and 11 funded. Across both application distributions, a total of 65 sites applied for up to US$500 in funding per site, with both cohorts concluding support in October 2022. In total, the FIG cohort allocated US$14,479 in farm-to-ECE funding to 31 sites for an average award of US$467.06. Funding impacted 1,214 children across 17 counties.

Data Collection

Upon receipt of funding, participants needed to complete a farm-to-ECE pre-assessment in Go NAPSACC (Ward et al., 2017) and create an action plan in Go NAPSACC supportive of their application. Go NAPSACC is a national, validated, strengths-based tool with evidence of positive health changes for early care and education settings and the children enrolled in them, including reduced obesity and improved nutrition environments (Ward et al., 2008), improved provider and family nutrition knowledge (Alkon et al., 2014), and ECE physical activity best practices (Bonis et al., 2014).

A Go NAPSACC farm-to-ECE post-assessment was also expected to be completed at the conclusion of the grant period, or approximately 6 months after the pre-assessment, to enable pre- and post-test comparison. Participants were emailed a link to complete a procurement pilot grant survey in Qualtrics consisting of 12 multiple choice, yes or no, and short response questions (Appendix). The goal of the survey was to learn more about the sites receiving funding, the farm-to-ECE activities in which they participated, challenges and successes in implementation of those activities, and resources used and the degree of helpfulness of those resources in supporting their implementation.

Participants were emailed at the conclusion of the procurement pilot period (mid-August 2022) to complete the post–farm-to-ECE self-assessment in Go NAPSACC, allowing at least 6 months between pre- and post-assessment. They were provided a link to an end-of-grant survey in Qualtrics. The survey was sent to all the procurement pilot participants, including those funded as part of the original pilot, with a reminder email sent approximately one week after the original email.

Analysis

Demographic data about the FIG cohort was gleaned from information participants provided as part of their Go NAPSACC profiles using the online Go NAPSACC software (Ward et al., 2017). Additional analysis of Go NAPSACC data was conducted to determine what changed from pre- to post-scores in farm-to-ECE practices and what, if any, best practices might have occurred. Data from the FIG cohort list was gleaned from the Go NAPSACC farm-to-ECE self-assessment summary report (Ward et al., 2017) available in digital format on demand upon the end of the grant period. Per

instructions from GO NAPSACC's farm-to-ECE analysis tool provided by the University of North Carolina (E. Clarke, personal communication, February 2, 2022), in spring 2022, the data set was cleaned and entered into an analysis tool provided by the University of North Carolina for this purpose. The analysis tool (an Excel spreadsheet prepopulated with formulas) enabled the user to import a specified set of Go NAPSACC data and perform paired sample t-tests and calculate the change in score (comparing pre-test to post-test), determining if the outcome was of statistical significance (*p*-value).

Although the survey had questions that would enable the extraction of data specific to the FIG cohort, many providers did not answer this question (date of procurement pilot participation) or indicated "unsure." As a result, it is difficult to filter or discern between the two funding sources with confidence, and the survey data were analyzed looking at both funding sources combined and reported in aggregate form. Additionally, content analysis of the open-ended responses using inductive coding was conducted to look for broad themes (Holton, 2007).

Results

Information on the type of provider participating in the procurement pilot, as well as practices around foodservice, help to frame the results. After a limited review of demographic information about the providers is shared, analysis of the Go NAPSACC is offered, noting a key takeaway of participants demonstrating improvements in total score and best practices at levels of statistical significance, with the top three improved practices involving gardening. Content analysis of the survey offers support for some of the quantitative results.

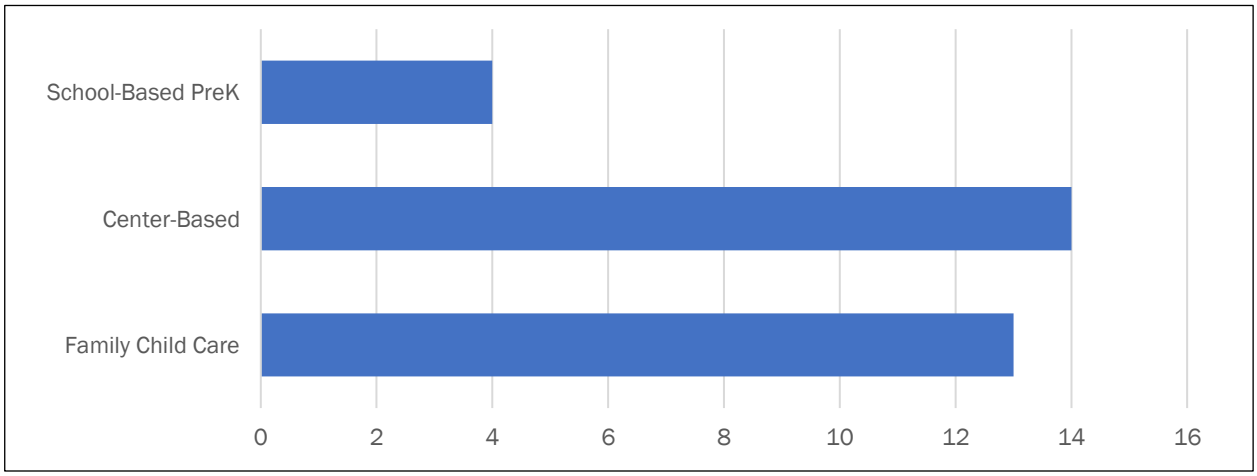
Demographic information provided from the Go NAPSACC website indicates that participants were from a mix of center-based, family child-care, and school-based prekindergarten sites (Figure 1). All but three indicated that they provided full-day care and provided food to the children in their care.

Of the 31 sites, 26 sites (83.8%) indicated that food was prepared by the kitchen and five indicated that food was sent with families to be prepared in their own homes. Go NAPSACC also enabled sites to indicate their participation in CACFP; 22 sites (71.0%) in the FIG cohort indicated participation. Based on Go NAPSACC data, 29 of 31 (93.5%) sites served breakfast and lunch. Both sites not offering breakfast and lunch did not participate in CACFP. An additional examination of meal participation shows 30 of 31 sites (96.8%) offered snacks, and nine (29.0%) offered dinner.

Farm-to-ECE Best Practices

A total of 22 sites (out of 31 total FIG-funded procurement pilot sites) completed both pre- and post–self-assessments for analysis. Paired sample t-tests indicated that sites completing pre- and post-assessment improved from pre- to post-test by a

Figure 1. Child-Care Setting Types of Study Participants



mean of 13.9 (p <.001) and improved the percentage of best practices from pre- to post-assessment by a mean of 14.9 (p <.001). At post-assessment, 40.9% of programs had post–self-assessments scores meeting greater than 50% of best practices.

Among 19 farm-to-ECE practices in the self-assessment, 18 saw a change across the period of data collection (Table 1). The top three practices with greatest change were garden-based practices, including "Children do a variety of activities to help plan, plant, care for, harvest, and learn from the garden" (n=22, Δ=1.23) followed by "During the growing season, structured gardening time is provided to preschool children 2 times per week or more" (n=22, Δ=1.09) and "Over the course of the year, 7 or more different fruits or vegetables grow in the program's garden" (n=22, Δ=1.00). These results are consistent with a review of procurement pilot applications, as every funded applicant indicated an intent to purchase gardening materials such as raised beds and gardening tools or plants and seeds using the procurement pilot stipend. Learning collaborative professional development requests were most frequently about gardening, and 399 providers completed an online on-demand professional development workshop about gardening during the procurement pilot enrollment period.

However, one practice remained static: "The program communicates about local foods included in meals or snacks through menus, farm information, recipes, signs, marketing materials, and other strategies" (n=22, Δ=0.00). The only practice with a decrease or negative change was "Teachers talk with children informally about where foods come from or how they grow each time they see an opportunity" (n=22, Δ=-0.09). These results suggest an opportunity to extend the role of gardening to aspects of family engagement and informal learning opportunities.

Table 1. Change in Go NAPSACC Best Practices Among Participants

Best Practice	Pre-test n	Pre-test Mean	Post-test n	Post-test Mean	% Meeting Best Practice (post)	Change (Mean)
A variety of local fruits, vegetables, herbs, grains, dairy products, and/or protein foods are offered over the course of the year	31	2.9	22**	3.0	45	0.14
Over the course of the year, local foods are offered as part of meals or snacks 1 time per week or more	31	2.6	22	2.9	45	0.23
During the growing season, local fruits and/or vegetables are offered as part of meals or snacks 3 times per week or more	31	2.7	22	3.0	55	0.23
The program communicates about local foods included in meals or snacks through menus, farm information, recipes, signs, marketing materials, and/or other strategies	31	2.1	22	2.1	9	0.00
The program has a garden that helps children learn how food grows and produces enough fruits and/or vegetables to be part of preschoolers' meals or snacks	31	2.3	22	3.2	36	.82
Over the course of the year, 7 or more different fruits and/or vegetables grow in the program's garden	31	1.9	22	3.0	32	1.00
The program's garden grows a variety of herbs, fruits, and/or vegetables to reflect the diverse food traditions of enrolled children	31	2.0	22	2.8	23	0.73
During the growing season, structured gardening time is provided to preschool children 2 times per week or more	28*	2.1	22	3.1	55	1.09
Children do a variety of activities to help plan, plant, care for, harvest, and learn from the garden	15*	2.4	22	3.7	77	1.23
Teachers offer planned education on food and where it comes from 1 time per week or more	31	2.2	22	3.0	41	0.91

continued

Table 1 continued

During the growing season, structured gardening time is provided to preschool children 2 times per week or more	28*	2.1	22	3.1	55	1.09
Children do a variety of activities to help plan, plant, care for, harvest, and learn from the garden	15*	2.4	22	3.7	77	1.23
Teachers offer planned education on food and where it comes from 1 time per week or more	31	2.2	22	3.0	41	0.91
During the growing season, preschool children do cooking or taste test activities with fresh fruits or vegetables 1 time per week or more	31	2.4	22	3.0	36	0.86
Preschool children have the opportunity to meet a farmer 1 time per year or more and families are invited to attend	31	1.7	11*	1.8	9	0.18
The materials used to help preschool children learn about food and where it comes from include a variety of posters, pictures, books, and props	31	3.2	22	3.7	73	0.45
Teachers talk with children informally about where foods come from or how they grow each time they see an opportunity	31	3.0	22	3.0	36	-0.09
All staff participate in Farm-to-ECE professional development related to their jobs 1 time per year or more	31	2.2	22	2.7	45	0.41
Professional development on Farm-to-ECE covers a variety of topics about buying and using local foods and educating children and their families about local foods	31	1.8	22	2.6	41	0.73
The program connects families to local foods in a variety of ways, including offering information, tastings, and opportunities to get involved with gardening and food education activities	31	1.8	22	2.4	27	0.50
Input from families is used in menu planning so that menus regularly include meals and/or snacks that reflect the cultural, ethnic, and/or religious food traditions of enrolled children	31	2.5	22	2.8	32	0.32
There is a written policy on Farm-to-ECE that includes a variety of topics related to the local foods that the program serves and other efforts to educate children and families and connect them to local foods	31	1.2	17	1.9	23	0.73

* This question was not completed by all participants for the self-assessment.
** Not all participants completed a post-assessment.

Survey Data

Participants were asked to complete a short, end-of-grant survey to gather additional data about their experiences in the procurement pilot, their implementation of early care and education activities, and helpfulness of the resources provided as part of the pilot. The survey data were examined to determine if and how respondents participated across all three core elements of farm-to-ECE (procurement, gardening, and nutrition and agriculture education activities). Of the 44 survey respondents, 28 (63.6%) providers purchased local foods, 35 (79.5%) engaged in gardening activities, and 27 (61.4%) implemented nutrition and agriculture education activities. As participants were not limited to a single response, results indicate overlap in activities among providers and that engagement in the elements is not mutually exclusive. This suggestion of overlap is consistent with the 2021 National Farm-to-ECE Provider Survey indicating that gardening was a top strategy among providers and used for multiple purposes, including the introduction of new foods (tasting), nutrition education, and supplementing food purchasing (Riemer Bopp et al., 2022a). The suggestion of overlap between and among the three core elements of farm-to-ECE is offered with caution, however, noting that shared language is essential (Thomas & McDonaugh, 2013). Based on the survey results for the procurement pilot, it is unclear if implementation of farm-to-ECE activities occurred in isolation, meaning gardening was a stand-alone activity,

or if gardening occurred as a procurement strategy and as part of nutrition education as well.

Of the 44 respondents, 31 (70.5%) indicated participation in CACFP. Participants were also asked about participation in another possible funding source, a state program providing 10 cents per meal in match for schools and centers serving state-grown fruits, vegetables, and legumes. For this option there were 43 responses available, with 9 indicating participation (20.9%) and 34 (79.1%) not participating. It is important to acknowledge that while CACFP participation is a requirement for the state program participation, at the time of the procurement pilot the state program was available for centers only.

In addition to examining meals served as indicated in Go NAPSACC profiles, the survey asked about the serving of meals and additional foods offered. For example, rather than simply asking about "snacks," the survey questioned specifically if morning or afternoon snacks were offered, as well as about the offering of other foods. Again, the inability to separate FIG-funded-only participants results in sharing data of the entire procurement pilot data. The survey data also revealed how participants served meals and snacks throughout the day (Figure 2), with most serving both breakfast and snacks.

Helpfulness of Resources

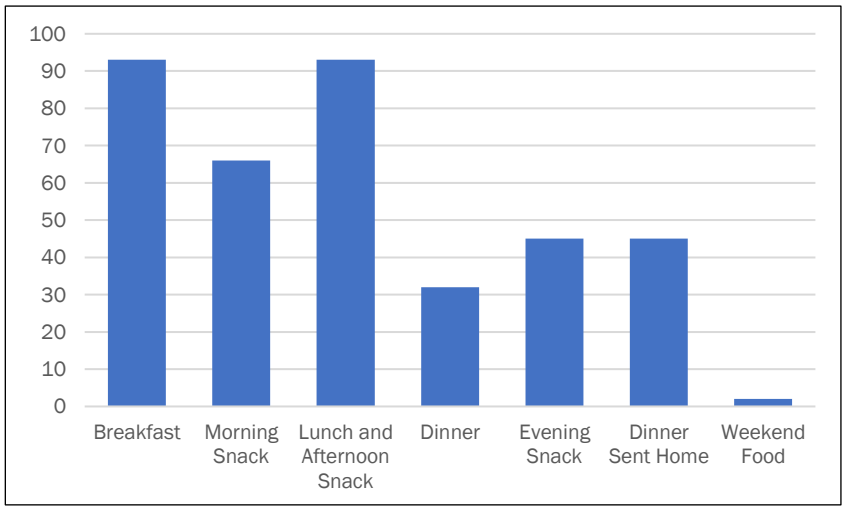
Providers were less likely to engage in virtual learning collaborative meetings due to schedule conflicts but utilized other "on-demand" resources provided electronically, including online professional development opportunities and Go NAPSACC and its corresponding resources. When asked about the "helpfulness" of resources offered during the procurement pilot, 39 participants responded to this section of questions. Combining responses of "extremely helpful" and "helpful," the Go NAPSACC resources, including provider information, menus, and family resources, were identified as the most helpful tools by 37 of 39 participants. The monthly newsletter created by project staff was distributed via email, approximately one page or less in length, and included information and hyperlinks for purchasing of local foods, gardening, nutrition education, family engagement, racial equity, and grant and funding opportunities. The newsletter was tied with the Go NAPSACC Action Plan for second-most-helpful (35 respondents indicating "extremely helpful" or "helpful"), followed by the Go NAPSACC self-assessment (34 respondents).

Open-Ended Responses

A final question of the survey was an open-ended inquiry regarding anything else providers wanted to share. Of 29 respondents, four broad themes emerged from the inductive analysis of the comments: 'appreciation and acknowledgement for the opportunity,' 'gardening,' 'experience,' and comments about what was accomplished. A provider's response could include more than one theme. This is evidenced in comments from providers such as:

> Thank you for offering us this opportunity. We have gardened for years, but this has allowed us to expand on what we do! The impact on our children is seen daily when they choose to go to the garden to tend to it, observe, or sneak a taste of a fresh green bean!

Figure 2. Percentage of Providers Offering Snacks and Meals



Another provider indicated that the program provided not only the opportunity for a garden for their site, but also hands-on learning and tasting experiences:

> I can't thank you enough for this opportunity to develop and grow a garden with the kids. We created drawings, started the plants from seeds, had circle time to discuss how the plants were growing, discuss how to keep the rabbits out, how to plant the trees, how the flowers turn into fruit, and so many more discussions and hands on experience these children had with growing their own food. They have picked green peppers, tomatoes, and couple beans straight from the garden and ate them right there. We also grew some nasturtium and they got to eat the flowers and taste the spicyness [*sic*] of the flower petals. This has been an amazing experience this summer.

Finally, one of the takeaways heard during the learning collaboration sessions and in one-on-one coaching was the desire to continue the procurement pilot and the use of resources beyond the established funding period. This included use of Go NAPSACC, but also additional resources, particularly funding, in large part due to ease of application and "low burden" paperwork, as noted by one provider's comment:

> The simplicity of [the] application and low reporting requirements made it much easier to ask for what we truly needed and not spend excessive amounts of time with paperwork. I hope this opportunity continues for providers across Michigan regardless of their stage in F2ECE implementation.

The procurement pilot offered a modest stipend and most applicants indicated their intent to purchase gardening materials, whether raised beds, tools, or plants and seeds. After six months, 18 of 19 practices assessed by Go NAPSACC showed improvement, with garden-based practices key among the top three. Given the hands-on experiential learning aspect of gardening, coupled with the opportunity to supplement the food supply, the results support recent research of a national survey as well (Riemer Bopp et al., 2022a).

Discussion

The objective of this evaluation was to determine what, if any, practices among the early care and education providers participating in the learning cohort were most effective in implementing farm-to-ECE with the goal to share statewide in Michigan. It was expected that challenges would also be shared, as what presents as a barrier for one site could be an opportunity for another. Key findings include improvements of statistical significance from pre-test to post-test and changes in best practices among participants, with garden-based practices noted as the top three most improved practices. Additionally, participants shared the value of the self-assessment tool, Go NAPSACC, its resources, and the action plan among the most helpful resources in the learning collaborative for implementing farm-to-ECE at their sites. As the pilot took place during the pandemic, this online tool was particularly helpful in identifying and building upon the existing strengths of a site, while also identifying areas of opportunity for continued focus and expansion of farm-to-ECE activities to support long-term and sustainable change. This project offered a small stipend for participants; thus, the role of funding is discussed, noting how reliance on grants both supports and creates challenges for farm-to-ECE initiatives. The feedback on the helpfulness of the resources coupled with the results from the self-assessment and survey data also offer insights for both statewide replication and implications for additional research.

Use of Go NAPSACC

One key finding is that participation in a farm-to-ECE learning cohort consisting of regular, albeit minimal, support resulted in positive changes in provider practices and the early learning environment. This was true whether the participant was in the cohort that began in November (with approximately 11 months of support) or February (with approximately 9 months of support). While it is notable that 18 of 19 possible farm-to-ECE practices saw changes from pre- to post-assessment in the Go NAPSACC self-assessment, the role of the

garden was among all three top practices with greatest change. Garden-based education offers experiential education, with physical distancing, if necessary, while simultaneously enabling ECE sites additional procurement options. This can be particularly helpful to introduce new fruits or vegetables to young children as part of tasting demonstrations or to supplement existing procurement options and address cost considerations. Challenges with gardening in early care and education exist and should be acknowledged, including but not limited to startup costs, maintenance, variability in growing seasons, and provider knowledge and skill (Dannefer et al., 2017; Riemer Bopp et al., 2022d).

This result also lends further support not only to the overlapping of the three core elements of farm-to-ECE, but perhaps offers a partial explanation, though certainly not cause, for positive changes as measured by the self-assessment across all practices. Moreover, it speaks to the availability of a garden for outdoor play and physical activity, supporting of learning opportunities and social emotional development, and increased access to nutritious food (Kos & Jerman, 2012; Nedovic & Morrissey, 2013; Perry & Branum, 2009). Also relevantly, some states are linking farm-to-ECE in their Quality Rating Improvement Systems and noting specific farm-to-ECE language in their standards that can be documented with Go NAPSACC (NFSN, 2022). Example states include Pennsylvania, Colorado, and Nebraska (NFSN, 2022). In considering implications for replication, Go NAPSACC offers the possibility for shared language, with a strengths-based approach to enable providers to share between and among themselves at a site, as well as with other providers, offering a definition of farm-to-ECE as well as strategies for implementation within their own setting.

As such, a major aspect of the procurement pilot was the use of Go NAPSACC to access data in real time to both providers and procurement technical assistance staff to determine strengths and continue to build on those skills and knowledge areas. An additional benefit was the ability to develop an action plan with specific goals to address and reassess their practices to affect positive, long-term change. Collectively, this enables ongoing quality improvement for program sustainability with policy, systems, and environmental changes taking place and remaining over time. Additionally, there are free, online, on-demand professional development workshops embedded in Go NAPSACC that are linked to the professional development registry system in Michigan. This is of further benefit to providers, offering free trainings for which they receive professional development credit as well.

Role of Funding

Given the importance of early care and education sites as a food source for young children, juxtaposed with the increasing cost of food for ECE sites, the use of funding sources to purchase locally produced, nutrient-dense foods to maintain high-quality learning environments is especially important. Among participants in the procurement pilot, about two-thirds leveraged CACFP funds. This is especially notable when comparing the Go NAPSACC best practices regarding purchasing and serving of local foods and is consistent with literature suggesting that CACFP participation addresses a common barrier to serving healthy foods (Lee et al., 2022). The 2021 National Farm to ECE Provider Survey identified cost as the most significant barrier to implementation of farm-to-ECE (Riemer Bopp et al., 2022d), resulting in a need to identify additional sources of funding. CACFP is one way to address this barrier, as it can positively affect purchasing power and encourage the purchase of local foods.

It is important to recognize, however, that one of the perceived benefits of the procurement pilot was the ease of a streamlined application and reduced administrative burden despite the modest amount of funding. This contrasts with perceptions of increased administrative burden and "altruistic" motivations for participation noted in recent research (Andreyeva et al., 2022). Further, the procurement pilots are one example of an attempt to initiate sustainability in farm-to-ECE within a state, with small investments at sites to establish on-site gardens and purchase smaller kitchen equipment like blenders, measuring cups, spoons, and child-safe knives for tasting demonstrations. The use of the funding also speaks to the overlap of the three

core elements of farm-to-ECE and the ways in which gardening can be used as a core element of farm-to-ECE while also supporting the other two core elements of procurement and nutrition education. However, isolated, one-time grants such as this are a Band-Aid approach, and long-term, sustainable funding is necessary for policy, systems, and environmental changes that address health and learning outcomes for young children. The use of Go NAPSACC to identify strengths within the ECE setting, set goals for improvement, and utilize existing resources were all identified as valuable aspects of the pilot and support existing research about flexible support using virtual or online technology (Ward et al., 2017).

Although the official pandemic orders have been lifted, the ECE sector has not fully recovered. Survey data suggest that four of five child care centers are experiencing staffing issues, and one in every three survey respondents from rural or small town sites considered closing programs as a result of the pandemic (National Association for the Education of Young Children [NAEYC], 2021). The NAEYC survey indicated that over half of minority-owned programs faced the possibility of permanent closure. It is important to acknowledge that there is "no farm to ECE without the ECE" (S. Bhat, personal communication, March 12, 2021). The pandemic offered insight into the fragmented, fragile, and inequitable child care system (Jessen-Howard et al., 2020). Despite these challenges, there are enthusiastic participants in farm-to-ECE willing to help answer the questions of if and how participation in a learning collaborative procurement pilot affects farm-to-ECE practices.

This study has important limitations worth noting. The first is the inability to separate the FIG-funded procurement pilot cohorts from the original procurement pilot cohort. While there were questions in place to aid in filtering the two groups, including the date of award and funding amount, these two questions were frequently left blank or the responses did not distinguish between the cohorts (e.g., the date of the award was not consistent with the cohort award amount). As a result, the researchers chose not to separate the survey data by cohort to enable analysis. Another potential limitation is differing dates or time periods within the cohort. For replication purposes, it is unknown if a 9-month cohort or an 11-month cohort is preferable to elicit change in provider practices in implementing farm-to-ECE activities. Despite the limitations, the study offers several areas of opportunity, including further examination of how funding opportunities are used by early care and education providers.

Implications for Research and Practice

Understanding the awareness of and knowledge about the three core elements of farm-to-ECE among providers is an important addition to both research and practice. Extant research has focused mostly on provider practices and less on provider knowledge (e.g., the practices in which they are engaging compose farm-to-ECE and how they support overall early care and education) and change in knowledge of purchasing foods, garden-based learning opportunities, and nutrition education. Based on common barriers identified in implementing farm-to-ECE (Riemer Bopp et al., 2022d), an understanding of both knowledge and practices would further inform farm-to-ECE efforts, particularly professional development and policy efforts. Additional research that includes observation to confirm providers' Go NAPSACC self-assessments is recommended for future studies as well.

Similarly, additional research to understand what, if any, knowledge and behavior changes occur for children and families as a result of participation in farm-to-ECE procurement pilots such as this one is essential. This would build on existing research of children's knowledge of where food comes from (Kos & Jerman, 2012) or curriculum efficacy (Izumi et al., 2015; Namenek Brouwer & Benjamin Neelon, 2013; Sharma et al., 2015), noting a gap in the literature in the overlap among the three core elements of farm-to-ECE and how they inform one another and children's knowledge about food and nutrition.

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Appendix. Michigan Farm to Early Care and Education Procurement Pilot Grant End Survey

Michigan Farm to ECE Procurement Project--Grant Ending Survey

Start of Block: Default Question Block

Q1 Please help us learn more about the Michigan Farm to ECE Procurement Pilot, beginning with learning about the different types of ECE settings in the project by sharing your ECE setting type:

- ○ Center Based (1)
- ○ Family Child Care (2)
- ○ Other (3) _____

Q2 Number of children currently enrolled at your site:

_____

Q3 Please indicate meals and snacks you serve each day (check all that you serve):

- ☐ Breakfast (1)
- ☐ Morning snack (2)
- ☐ Lunch (3)
- ☐ Afternoon snack (4)
- ☐ Dinner (5)
- ☐ Other (6) _____

Q4 Do you participate in the Child and Adult Care Food Program (CACFP)?

- ○ No (1)
- ○ Yes (2)

Q5 Do you participate in 10 Cents a Meal?

- ○ No (1)
- ○ Yes (2)

End of Block: Default Question Block

Start of Block: Block 1

Q6 Amount of funding you received as part of the Michigan Farm to ECE Procurement Pilot:

_____

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Q7 Amount of funding you spent:

_____

Q8 As there were multiple cohorts in the pilot, please indicate the length of time of your grant (please select):

- ○ September 1, 2021-August 30, 2022 (1)
- ○ November 1, 2021-October 31, 2022 (2)
- ○ March 1, 2022-October 31, 2022 (3)
- ○ Unsure (4)

End of Block: Block 1

Start of Block: Block 2

Q9 Please indicate the farm to ECE activities you focused on with your funding (check all that apply):

- ☐ Purchasing (procurement) (1)
- ☐ Gardening (2)
- ☐ Nutrition and agriculture education (3)

Q10 Please share any successes with farm to ECE and/or the procurement pilot:

_____

Page 3 of 5

Q11 Please share any challenges with farm to ECE and/or the procurement pilot:

_____

Q12 Please rate how helpful you've found the following resources:

	Extremely helpful (1)	Helpful (2)	Neither helpful or unhelpful (3)	Unhelpful (4)	Don't Use (5)	Didn't know about it (6)
MI Farm to ECE Procurement Pilot Monthly Newsletter (1)	○	○	○	○	○	○
Go NAPSACC self assessment (2)	○	○	○	○	○	○
Go NAPSACC action plan (3)	○	○	○	○	○	○
Go NAPSACC resources (materials and handouts) (4)	○	○	○	○	○	○
Go NAPSACC trainings/workshops (5)	○	○	○	○	○	○
MI Farm to ECE Network website (6)	○	○	○	○	○	○
MI Farm to ECE Network meetings (7)	○	○	○	○	○	○
MI Farm to ECE Network listserv (8)	○	○	○	○	○	○

Q13 Anything else you would like us to know about your experience in the procurement pilot:

_____

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The importance of nutrition-sensitive fisheries management: Women's dietary diversity in Marovo Lagoon, Solomon Islands

Sheridan Rabbitt,[a] * Ian Lilley,[b] Simon Albert [c]
The University of Queensland

Joelle Albert [d]
Island Elements

Ian R. Tibbetts [e]
The University of Queensland

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Abstract

Feeding a growing global population is one of the most significant challenges currently facing society. Global malnutrition rates remain high, and tackling this problem in the context of global population growth and ecosystem declines will require concerted effort across many sectors. Fish has been suggested as key to addressing high rates of malnutrition in the South Pacific region, given that it is a rich source of highly bioavailable micronutrients and is common in traditional diets. Unfortunately, there are predictions that fish catch in this region may decline by more than 20% in the coming decades, threatening food and nutritional security.

[a] * *Corresponding author:* Sheridan Rabbitt, Ph.D. Candidate, School of Biological Sciences and Centre for Marine Science, The University of Queensland; Goddard Building (8); St. Lucia, Queensland, Australia, 4072; Sheridan.rabbitt@uqconnect.edu.au

Dr. Rabbitt has since been awarded her Ph.D. and is now Senior Project Officer at the Centre for Marine Science.

[b] Ian Lilley, Emeritus Professor, School of Social Science and Centre for Marine Science, The University of Queensland; Michie Building (9); St. Lucia, Queensland, Australia.

[c] Simon Albert, Senior Research Fellow, School of Civil Engineering and Centre for Marine Science, The University of Queensland; Advanced Engineering Building (49); St. Lucia, Queensland, Australia, 4072.

[d] Joelle Albert, Founding Director, Island Elements; Fig Tree Pocket; Queensland, Australia, 4069.

[e] Ian R. Tibbetts, Associate Professor, School of Biological Sciences and Centre for Marine Science, The University of Queensland; Goddard Building (8); St. Lucia, Queensland, Australia, 4072; i.tibbetts@uq.edu.au

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Women are key to breaking the cycle of malnutrition and play important roles in small-scale coastal fisheries in the South Pacific. This study assessed women's dietary diversity and the importance of fresh fish to women's diets in a rural coastal community in Marovo Lagoon, Solomon Islands, over four sampling periods. We found that women's dietary diversity in the community was low (mean MDD-W = 3.03 ± 0.06) and that fresh fish was consumed by more than 70% of the women surveyed in three of the four sampling periods. Our results showed some seasonal differences in dietary diversity, highlighting the importance of sampling across seasons to better capture true nutrition. We consider these results in the context of community-based fisheries management and argue for the need to improve fisheries management by including consideration of women's fishing and promoting the importance of fish to human health.

Keywords
malnutrition, fish, Pacific Islands, dietary quality, food systems, nutrition-sensitive fisheries, gender

Introduction

Achieving global food and nutritional security is one of the greatest challenges facing humanity. Intertwined with this is the challenge of sustainably managing fish stocks for nutritional security. Global marine fishery resources continue to decline (Food and Agriculture Organization of the United Nations [FAO], 2020), and it is predicted that 11% of the global population is likely to experience deficiencies in zinc, iron, or vitamin A owing to global declines in fish landings (Golden et al., 2016). An additional 19% will likely experience deficiencies in vitamin B_{12}, omega-3 fatty acids, and other micronutrients (Golden et al., 2016). Nearly one billion people are currently food insecure (FAO, International Fund for Agricultural Development [IFAD], & World Food Programme [WFP], 2013). Concerningly, progress on reducing rates of global malnourishment has been slow, with 149 million children under five years of age affected by stunting and 45 million experiencing wasting in 2020, while 768 million people were undernourished (FAO, IFAD, UNICEF, WFP, & World Health Organization [WHO], 2021). Micronutrient deficiencies are a leading cause of infant mortality, responsible for 50% of child deaths under the age of five years in Africa (Development Initiatives, 2017). Nutritional deficiencies are also a major cause of developmental issues, which affect lives and livelihoods, leading to lost productivity and reductions in gross domestic product (International Food Policy Research Institute [IFPRI], 2016).

The Pacific Islands Countries and Territories (PICTs) experience some of the highest rates of malnutrition in the world (Bogard et al., 2021; Development Initiatives, 2020). Fish[1] has been suggested as key to addressing many of the nutritional challenges facing the PICTs, given that it is a rich source of bioavailable micronutrients and fatty acids (Golden et al., 2016; Hicks et al., 2019). However, climate change and overfishing threaten marine resource sustainability (Ford et al., 2017; MacNeil et al., 2015; Pauly & Zeller, 2016; Western and Central Pacific Fisheries Commisson [WCPFC], 2004), and fish declines pose a significant risk to food and nutritional security (Mellin et al., 2022). Predictions indicate that fish catch potential will decline by more than 20% in the South Pacific by the year 2050 (Golden et al., 2016; Pauly & Zeller, 2016), which will have major implications for population health in the region. Globally, fish accounts for about 17% of animal-source protein intake (FAO, 2016), but for the PICTs, consumption rates for fresh fish can be as high as 110kg per year in some countries, accounting for around 90% of total protein intake (Bell et al., 2009). Current estimates for inshore fisheries in the Pacific indicate that approximately 70-80% of catch is for subsistence purposes, while only about 20% reaches the commercial market, further highlighting the important contribution fish makes to household diets (Lambeth et al., 2002). Many marine resources are common in diets in coastal communities in the PICTs, including finfish, crustaceans, and marine molluscs, all of which have different nutritional compositions and thus provide a rich

[1] The term "fish" is used in this paper to refer to a broad range of marine resources, including teleost fish, sharks and rays, molluscs, crustaceans, and other marine invertebrates, but excluding turtles, marine mammals, and marine plants.

source of a range of micronutrients important to human health (Hicks et al., 2019).

Solomon Islands lies in the South Pacific on the eastern edge of the Coral Triangle, the center of global marine biodiversity (Foale et al., 2013; Veron et al., 2009). It comprises an archipelago of nearly 1,000 islands (Johannes & Lam, 1999; McCarter et al., 2018), and is considered one of the world's least developed countries, scoring low on a number of the United Nations' development indicators (Department of Economic and Social Affairs [DESA], 2021; United Nations Development Programme [UNDP], 2014). Most of the population lives in coastal villages, with 94% living within 5 km of the coast (Foale et al., 2010). Traditional diets consist primarily of fish and starchy root crop vegetables (Albert et al., 2020; Anderson et al., 2013; Govan et al., 2013). Aquatic foods are the second most consumed food group in Solomon Islands, after roots and tubers (Farmery et al., 2020). As with many PICTs, Solomon Islands suffers from high rates of malnutrition, and in recent years there has been an increased consumption of imported foods, such as rice and noodles, that are of low nutritional value (Albert & Bogard, 2015; Albert et al., 2020; Anderson et al., 2013).

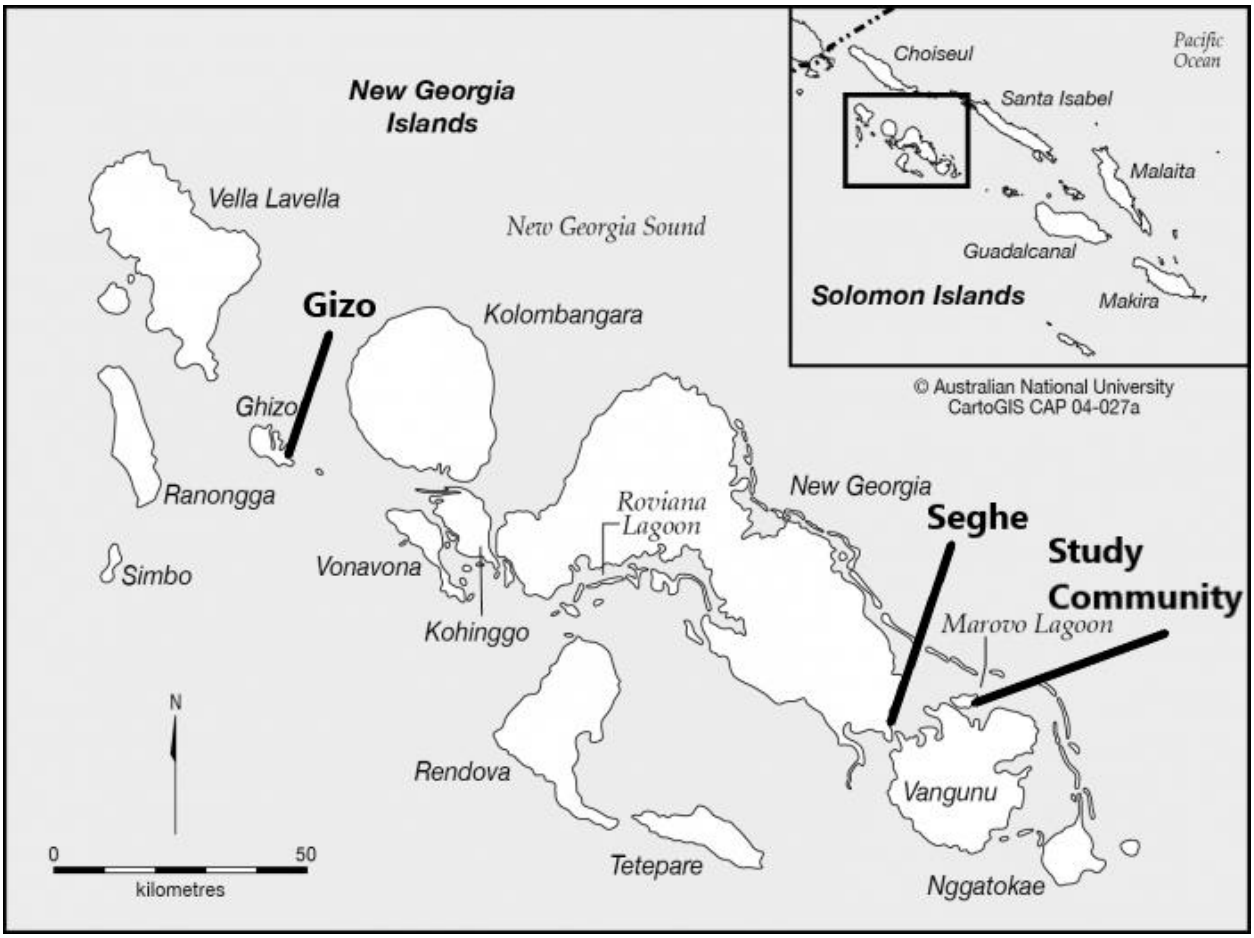
Women play key roles in ensuring that food security and nutritional needs are met for all household members (Andrew et al., 2019) and are largely responsible for all household duties (Lawless & Teioli, 2015), which includes providing food for the household. Previous studies have shown that there is a strong association between maternal and children's dietary diversity, suggesting that improving women's dietary quality can have flow-on effects for children and the household more broadly (Amugsi et al., 2015; Bonis-Profumo et al., 2021; Nguyen et al., 2013). Women are heavily involved in many aspects of the small-scale fisheries value chain (E. Bennett, 2005; Harper et al., 2020; Harper et al., 2013; Mangubhai et al., 2016; Vunisea, 2016; Weeratunge et al., 2010), and fish primarily for the purpose of feeding their families (Rabbitt et al., 2019; Thomas et al., 2021). Previous research suggests that women's fishing is important for household nutrition (Thomas et al., 2021); however, seldom are the impacts on women's access to fishing grounds considered in fisheries management actions (Aswani & Weiant, 2003; Westlund et al., 2017), which can have flow-on socio-cultural and health effects (Aswani et al., 2014; Thomas et al., 2018).

Here we investigate women's dietary diversity in a rural coastal community in Marovo Lagoon, Western Province, using the FAO's minimum dietary diversity of women (MDD-W) indicator (FAO & FHI 360, 2016), a proxy measure for community-level micronutrient adequacy, to understand the quality of women's diets and the relative importance of fresh fish and other seafoods. We consider this in the context of fisheries management and use these data to highlight the importance of nutrition-sensitive fisheries management for women and children's health in Solomon Islands.

Methods

This study was conducted in a rural village in Marovo Lagoon, Western Province, Solomon Islands (Figure 1). The village is located within a sheltered lagoon, and the community experiences minimal weather-related disruptions to their fishing and gardening activities. The dominant religion is United Church, which imposes few restrictions on the types of food community members can consume. The community is considered large for the locality, with approximately 100 households. It has good access to markets at the township of Seghe, the nearest administrative center (20 minutes by outboard motor [OBM]–powered canoe), as well as at the capital (Honiara) and provincial capital (Gizo; see Figure 1) via passenger and cargo ships that run twice weekly. Many of the youth in the community are employed at a nearby tourist resort, and the village receives semiregular visits from international tourists. There are also several canteens in the village that sell imported foods including noodles, rice, sugar, biscuits, and canned fish. The main sources of income for the village's residents are wage labor from resort and timber logging employment, local handicrafts, and sale of fish and garden produce at markets. Many members of the community are also engaged in the 'esky trade,' sending fish to Honiara via ship in large, insulated containers (eskies) for sale at large fish markets.

Figure 1. Map of the Western Province, Solomon Islands, Showing the Location of the Study Community and Nearby Provincial Hubs



Map sourced from CartoGIS Services, College of Asia and the Pacific, The Australian National University.

Women's Dietary Diversity Survey

We conducted quantitative surveys of food consumption with consenting adult women in the community in May 2017, October 2017, April 2018, and September 2018. These sampling periods broadly represent the autumn and spring months. We conducted 24-hour food recalls using an open recall method, and asked participants to detail all food and drinks they had consumed within the past 24 hours. A story method was employed after the open recall, and participants were asked to detail their activities within the previous 24 hours as a way of prompting participants to remember any food items they may have missed during the earlier recall sessions.

The food recall surveys were announced primarily through word of mouth. On each day that food recalls were conducted, the lead author and a local research assistant identified potential participants by walking through the village and inviting women to participate. Participation in the interviews was voluntary. Where women were willing to participate, they were read a participant information sheet which outlined their rights and responsibilities should they choose to participate and were then asked to sign an informed consent form. The food recall interviews were conducted in Solomon Islands Pijin, the national *lingua franca,* but local language names were used for all seafood items and many garden items. In total, 199 women ranging from 19 to 81 years of age were interviewed across the four sampling periods.

Dietary diversity was measured using the FAO's MDD-W indicator, a proxy measure of

micronutrient adequacy at a population level. The MDD-W indicator is calculated as the proportion of women who consumed five or more of the 10 food groups (FAO & FHI 360, 2016). As noted in Albert et al. (2020), the 10 food groups outlined in this global indicator of micronutrient adequacy may not accurately reflect micronutrient adequacy in Pacific Islander diets. Although the MDD-W indicator is designed to capture data on women of reproductive age (15–49 years), we elected to include women over the age of 49 in our surveys, as many older women in this community were the primary caregivers for young children (less than five years of age), and we were interested in understanding micronutrient adequacy in women caregivers, as ensuring nutritional adequacy in women is critical to breaking the cycle of malnutrition (Andrew et al., 2019). Food and drink items were categorized as per the MDD-W guidelines, with *The Pacific Islands food composition tables* (Dignan et al., 2004) and the Leafy Greens and Vegetables in Solomon Islands (French, 2010) guidelines used to assist in categorization of common local food items.

Results

Overall, dietary diversity was low, with just over 5% of women achieving the MDD-W by consuming at least five food groups across all sampling periods combined (mean MDD-W = 3.03 ± 0.06; Table 1). In three of the four sampling periods, less than 5% of women achieved the MDD-W, while 18.4% of women attained the MDD-W in the October 2017 sampling period (Table 1). Most women (42.1%) across the sampling periods consumed only three of the 10 food groups that make up the MDD-W. All women reported consuming food from the grains, white roots, tubers, and plantains category, predominantly cassava, sweet potato, and white rice. Over 80% of women reported consuming meat, poultry, and fish in three of the four sampling periods, with just over 65% of women consuming food items from this category during sampling in September 2018. Consumption of dark leafy greens was also high, ranging from 50–65% in the spring months, and 38–44% in the autumn months. Over 40% of respondents also reported consuming other fruits in all four sampling periods. Consumption of other vitamin A–rich fruit and vegetables was low in all sampling periods (2–13%), with similarly low consumption rates for other vegetables (2–6%). Consumption of nuts and seeds was low during the autumn months (2.8% in May 2017 and 7.4% in April 2018), but higher during the spring months (23.7% in October 2017 and 25% in September 2018). Consumption of eggs and dairy was very low, with 0–3% of respondents reporting consumption of either food type in each sampling period. No respondents reported consuming pulses in any sampling period.

Data for the autumn (May 2017 and April 2018) and spring (October 2017 and September 2018) months were combined to investigate sea-

Table 1. Minimum Dietary Diversity of Women (MDD-W) in the Study Community Across the Four Sampling Periods

	2017		2018		
	May	October	April	September	Overall
Number of women (*n*)	36	38	81	44	199
% attaining MDD-W	2.8	18.4	4.9	2.3	5.0
Mean MDD-W (st error)	2.94 (0.16)	3.18 (0.18)	2.96 (0.09)	3.07 (0.14)	3.03 (0.06)
% consumed 1 food group	5.6	2.6	3.7	4.5	4.0
% consumed 2 food groups	27.8	31.6	21	22.7	24.6
% consumed 3 food groups	36.1	23.7	55.6	36.4	41.7
% consumed 4 food groups	27.8	31.6	14.8	34.1	24.6
% consumed 5 food groups	2.8	15.8	4.9	2.3	4.5
% consumed 6 food groups	0	2.6	0	0	0.5

sonal influences on women's diets. The mean MDD-W score in spring (September/ October) was higher than the mean MDD-W in autumn (Figure 2). Radar graphs show the percentage of women consuming each of the different food groups in the autumn and spring months (Figures 3a and 3b, respectively), and show a higher proportion of women consuming nuts and seeds in the spring months, which is the driver of the higher MDD-W scores in these months compared to the autumn months.

Consumption of fresh seafood was high, with over 70% of women consuming fresh seafood in three of the four sampling periods (Figure 4). We did not combine the data for May/April and September/October for this variable, as events within the community impacted data collection in one of the four sampling periods. In September 2018, there were two deaths in the village during the sampling period. Local customs require a period of two to three days of mourning following the death of a community member, and fishing is not permitted during this time. This factor is the likely driver of the significant decline in fresh fish consumption seen in Figure 4, with only 31.3% of women consuming fresh seafood during this sampling period.

We also examined consumption rates of the different food items that make up the 'meat, poultry and fish' category. As respondents had provided local species names for seafood consumed, we were able to assign food items in this category to six broad groups: reef fish, pelagic fish (which we define as fish species that are not generally associated with nearshore habitats), invertebrates (including clams, oysters, marine crabs, and coconut crabs), marine

Figure 2. Mean and Range of the Minimum Dietary of Women (MDD-W) Scores for the Autumn (May/April) and Spring (September/October) Months

The box represents the 25th–75th percentile of responses, the whiskers represent the range of responses, and the X represents the mean. Note that the 5 is an outlier in the May/April dataset.

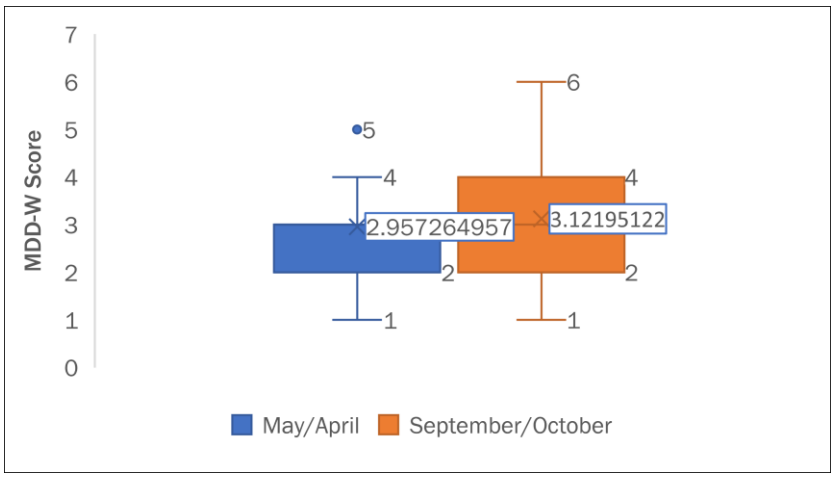
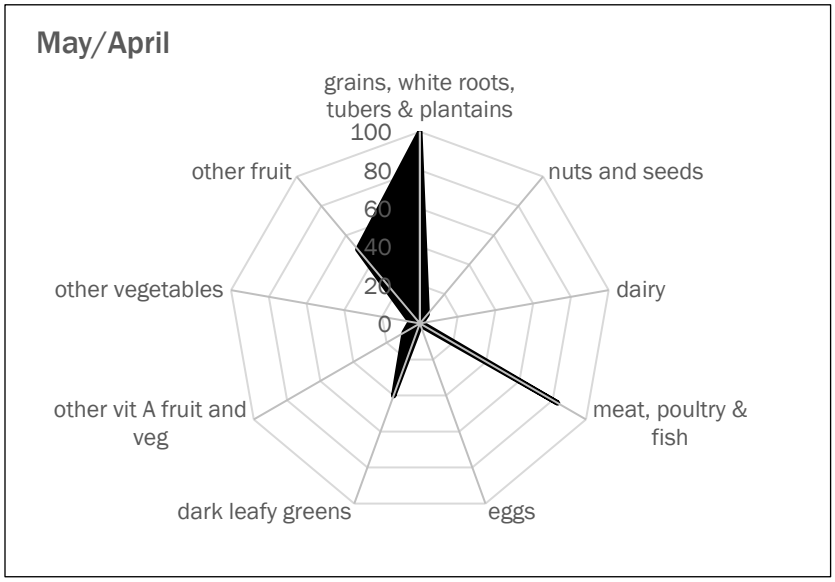


Figure 3a. Proportion of Women Consuming Food Items from Each of the 10 Food Groups That Make Up the Minimum Dietary Diversity of Women Indicator (MDD-W) in the Autumn Months (May/April)

The axis from the centre to the outer degree represents the proportion of respondents who consumed each food group.[a]

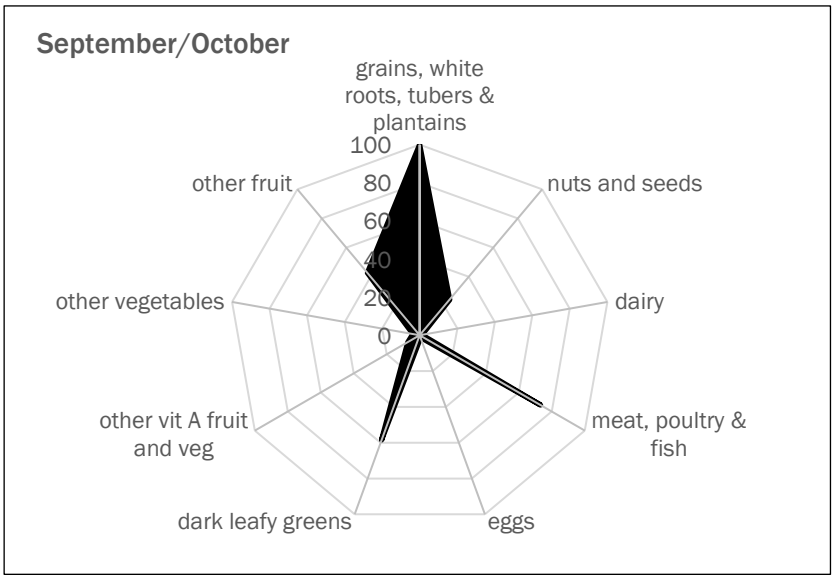


[a] Note that the 'pulses' food category has been excluded, as foods from this category were not consumed during any sampling period.

turtles, canned tuna, and other meats (which included both fresh meat such as chicken, and tinned meats such as Spam). When the spring (September/October) and autumn (May/April) months were combined and compared, the consumption of reef fish was more than double that of the consumption of pelagic fish species in both periods (48.7% vs 19.7% in autumn, and 39.4% vs 13.4% in spring; Figure 5a). Consumption of invertebrates was more than three times higher in autumn than it was in spring (15.4% vs 3.7%), while turtle meat consumption was low across both seasons. Consumption rates of both meat products and canned tuna were higher in September/October compared to May/April; Figure 5b shows that in the September 2018 sampling period, canned tuna accounted for 50% of all the meat, poultry and fish consumption. As noted above, the two deaths in the village during this sampling period prohibited most community members from accessing fresh seafood, which could explain the higher consumption of canned tuna during this sampling period.

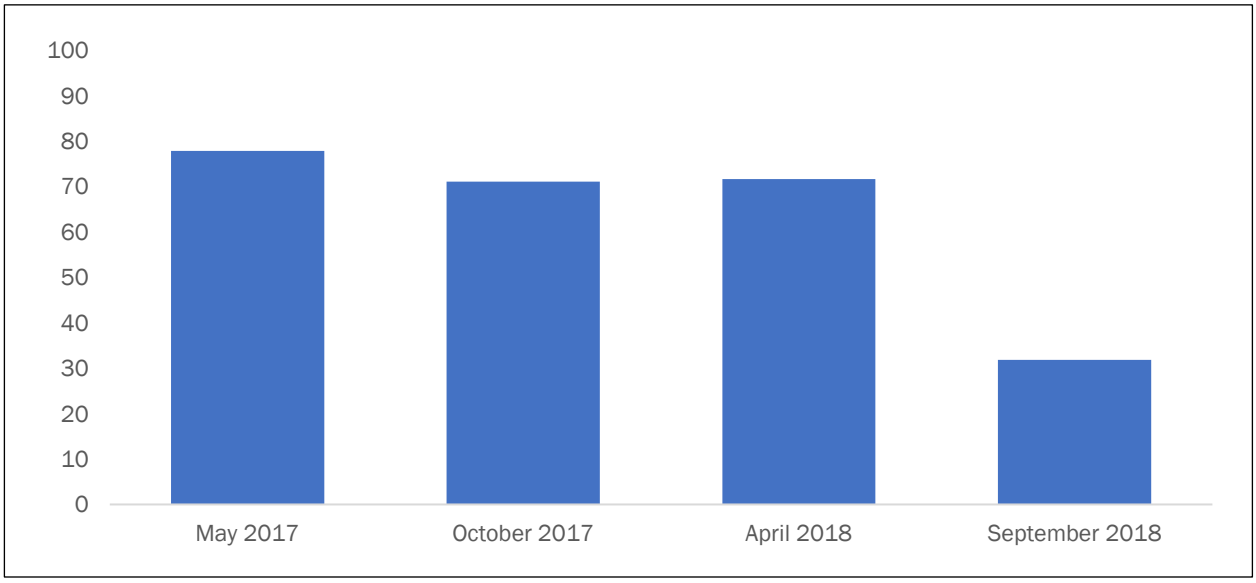
Figure 3b. Proportion of Women Consuming Food Items from Each of the 10 Food Groups That Make Up the Minimum Dietary Diversity of Women Indicator (MDD-W) in the Spring Months (September/October)

The axis from the center to the outer degree represents the proportion of respondents who consumed each food group.[a]



[a] Note that the 'pulses' food category has been excluded, as foods from this category were not consumed during any sampling period.

Figure 4. Percentage of Women Who Consumed Fresh Seafood During the Sampling Periods



Discussion

To break the intergenerational cycle of malnutrition, it is critical that women are able to meet their nutritional needs through diets that provide a diversity of micro- and macronutrients (Andrew et al., 2019). Women's diets in the study community were nutritionally inadequate, with only 5% of women overall meeting the minimum dietary diversity threshold for micronutrient adequacy, following the minimum-dietary diversity for women (MDD-W) guidelines (FAO & FHI 360, 2016). This is consistent with the results of studies in

Figure 5a. Combined Data Showing the Percentage of Women Consuming Different Animal-Source Proteins in May/April Compared to September/October

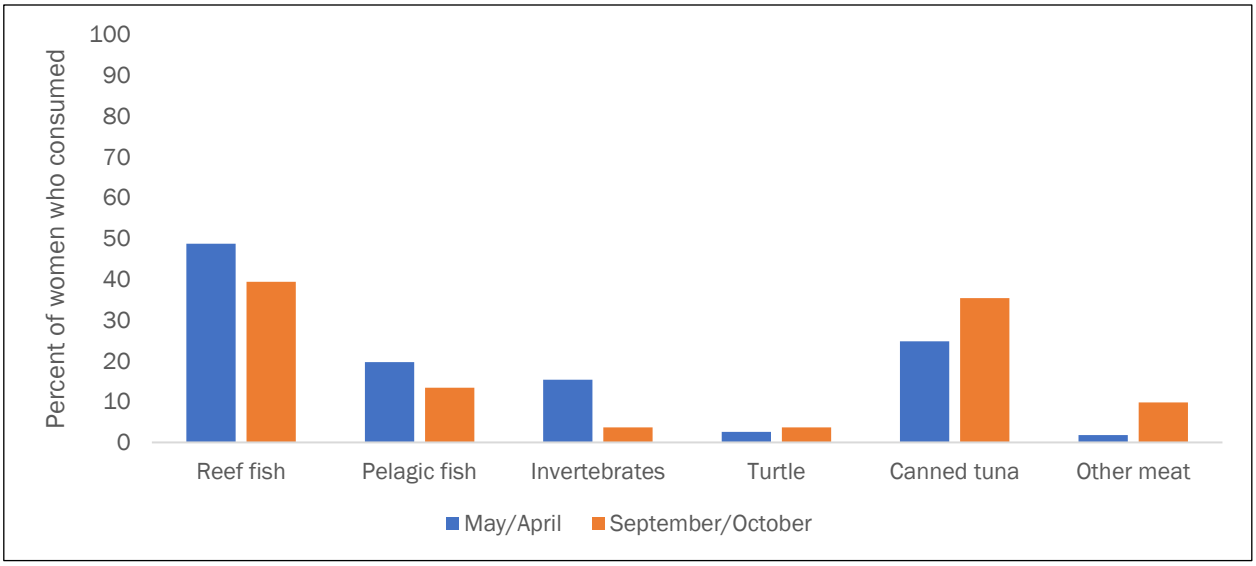
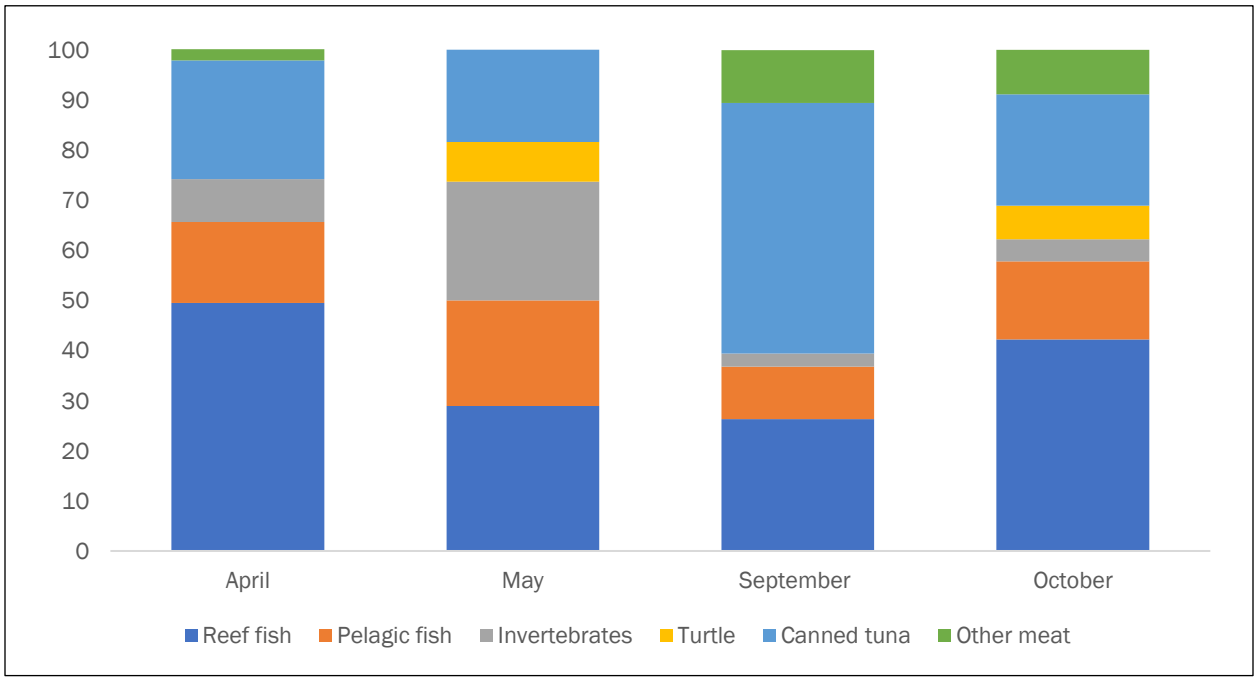


Figure 5b. Contribution of Different Animal-Source Proteins to Women's Diets Across the Four Sampling Periods (Percentage of Animal-Source Protein Consumption by Category)



other communities in Solomon Islands (Albert et al., 2020; Horsey et al., 2019; Iese et al., 2021), indicating that the country is facing a widespread nutritional crisis. Although overall dietary diversity was low, it was higher in the spring months (September/October) than in the autumn (April/May). Increased dietary diversity in the spring months was driven largely by consumption of ngali nuts (*Canarium spp.*), which local seasonal calendars show are in season from July through October (Jones et al., 2014). This seasonal difference highlights the importance of assessing dietary diversity throughout the year, rather than at a single timepoint, to better capture the impacts of local seasonal changes in food availability, particularly in rural areas. Sampling at different times of the year paints a clearer picture of true nutrition, and allows for inclusion of seasonal foods, such as ngali nuts, that may play important roles in women's nutrition that would be missed if sampling only occurred outside of their fruiting season. Importantly, survey responses indicated that most main meals consisted largely of a marine food item, rice or starchy root crop vegetable, and a dark leafy green. Almost all consumption of fruit, other vegetables (excluding dark leafy greens and starchy root crops), and nuts was incidental consumption that occurred while women were travelling through the village to their gardens or to visit friends and relatives. This has important ramifications for strategies that aim to increase dietary diversity in these rural communities, and policymakers should consider the importance of incidental consumption as part of a holistic approach to encouraging increased dietary diversity.

Dietary diversity is unquestionably important, but fish is likely to play a large role in addressing malnutrition in Solomon Islands (Albert & Bogard, 2015). Unfortunately, overfishing and the impacts of climate change are already negatively affecting food and nutritional security globally. One study found that the undernourishment of around 20 million people in the year 2000 could have been avoided had overfishing not occurred (Srinivasan et al., 2010), highlighting the need for effective and nutrition-sensitive fisheries management policies. In Solomon Islands, most of the population live in rural, coastal villages (Foale et al., 2010) with limited land for farming fish or animal livestock. Fish is a rich source of highly bioavailable nutrients (Allison, 2011; Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Hicks et al., 2019), which is not easily replaced by any other animal food source. It is also the only animal source food that is protective against chronic disease (Bogard et al., 2019; Jayedi & Shab-Bidar, 2020). Although aquaculture has been proposed as a way of addressing the shortfall in wild-caught fish (Bell et al., 2009; FAO, 2020; Fiorella et al., 2021; Weeratunge et al., 2011), farmed fish are often less nutritious than their wild-caught counterparts (Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Fiorella et al., 2021). Thus, while aquaculture may bolster food supply, it might not address rates of malnutrition, particularly micronutrient inadequacies, and will not resolve the issue of overfishing. It is therefore critical that we reverse the decline of wild-capture fisheries and bring a nutrition lens to management strategies if we are to tackle malnutrition.

Our results show that women consume large amounts of fish and other marine foods, with reef fish accounting for the majority of marine food types consumed. While there has been much focus on the use of pelagic fish, such as tuna, to address food security concerns in the Pacific (Bell, Albert, Amos et al., 2018; Bell, Albert, Andréfouët et al., 2015; Bell, Allain et al., 2015; Bell, Cisneros-Montemayor et al., 2018; Bell et al., 2009; Bell et al., 2013; Pilling et al., 2015), pelagic fisheries tend to be the domain of men (Chapman, 1987; De la Torre-Castro et al., 2017; Kleiber et al., 2015; Kronen, 2002; Kronen & Vunisea, 2009), who have different motivations for their fishing and are often fishing to sell their catch for cash income (Rohe et al., 2018). We found that pelagic fish, primarily caught by men, were consumed at about half the rate of reef fish, highlighting the importance of reef fish to household nutrition.

Women generally fish closer to the shore than men (Kleiber et al., 2014, 2015; Rabbitt et al., 2019; Thomas et al., 2021), primarily because of limitations on their time owing to their caring responsibilities (G. Bennett et al., 2014; Kleiber et al., 2018; Lawless et al., 2019; Vunisea, 2008). Management actions that restrict women's access to nearby reefs, making them travel further to fish, would

likely lower household consumption of fresh fish, as it is unlikely that the deficit would be compensated by pelagic fish caught by men.

More likely, a decline in reef fish availability would see an increase in consumption of tinned meat, including tuna, which is high in saturated fats and salt (Golden et al., 2016; Kawarazuka & Béné, 2010; Thomas et al., 2021). This is reflected in our data for September 2018, which showed a spike in the consumption of tinned tuna when the supply of fresh fish was reduced owing to cultural mourning practices. A reduction in women's fishing would likely have negative flow-on effects for women and children's nutrition, given that women's catch goes primarily to household food consumption (Harper et al., 2013, 2020; Rabbitt et al., 2019; Thomas et al., 2018, 2021).

Throughout the Pacific, women are often either excluded from, or have limited agency in, fisheries management decisions for a variety of reasons, including both cultural norms and constraints on their time owing to their household responsibilities (Kleiber et al., 2018; Leisher et al., 2018; Rabbitt et al., 2022; Rohe et al., 2018; Vunisea, 2008). Most coastal fisheries in Solomon Islands remain under customary tenure (Walter & Hamilton, 2014; Warren-Rhodes et al., 2011) and are therefore managed at a community level under community-based fisheries management (CBFM) plans (Solomon Islands Ministry of Fisheries and Marine Resources [MFMR], 2019). Women's voices are often left out of CBFM decision-making (Rabbitt et al., 2022), including for decisions that affect women more than men (Rabbitt et al., 2022; Vunisea, 2008; Westerman & Benbow, 2013), such as *tabu* sites[2] being placed in women's fishing grounds (Rohe et al., 2018). There is a clear need for gender-sensitive CBFM strategies that actively seek to include the voices of all community members, to ensure equitable and sustainable resource use (Kleiber et al., 2015, 2018; Ogden, 2017; Rabbitt et al., 2022; Thomas et al., 2021). As we have stated above, there is also a clear need for nutrition-sensitive fisheries management (Albert & Bogard, 2015), which considers the important role that fish and other marine resources play in nutrition. Research to date has largely focused on these approaches in isolation, but our results highlight the need for an approach to fisheries management that considers the important contributions fish make to nutrition, the different ways that men and women engage in fisheries, and the different contributions of men's and women's fishing to household, and community, food and nutritional security.

Recommendations

Our results, and those of other studies (e.g., Albert et al., 2020), highlight the need to further research the nutritional value of traditional Pacific Island diets. Several studies in the Solomon Islands (Albert et al., 2020; Horsey et al., 2019; Iese et al., 2021) suggest that women are consistently not meeting the minimum dietary diversity indicator for micronutrient adequacy. Public health interventions are often aimed at encouraging Pacific Islanders to consume a more traditional diet, but that diet often includes fewer food groups than is required to meet the minimum dietary diversity set out by the MDD-W indicator. A more in-depth study of the nutritional breakdown of traditional Pacific Island foods is needed to better understand whether traditional diets are nutritionally adequate and whether the use of standardised indicators is appropriate in the Pacific Islands context. In addition, our research shows the importance of sampling at different timepoints; doing this allowed us to pick up on seasonal consumption of ngali nuts that we would have missed had we only sampled earlier in the year. Given that nuts are not the only seasonal food in Solomon Islands, ideally this work should be expanded to year-round dietary diversity sampling, making use of local seasonal calendars (Jones et al., 2014) to gain a clearer picture of women's nutrition.

Our results indicate that public health interventions highlighting the importance of eating a

[2] Implementing a *tabu* site (protected area) is common practice in CBFM in Solomon Islands, and these usually take the form of a periodically harvested closure. The period of closure differs significantly between communities and is often poorly aligned with the life history strategies of the species it aims to protect (Smallhorn-West et al., 2022).

varied diet and encouraging an increased consumption of fruits and vegetables are much needed to improve women's dietary quality in Solomon Islands. It is likely that women in rural and urban areas of Solomon Islands face very different challenges in accessing nutritious foods. For rural areas, the majority of the household diet is either grown or caught locally, and nutritious foods tend to be readily available. In urban areas, much of the food consumed is purchased in stores and larger markets, and thus women in these areas face cost pressures in accessing nutritious foods not faced by their rural counterparts. We suggest that women in rural and urban areas may benefit from targeted yet different public health interventions. Our study found low levels of fruit and nut consumption, despite an abundance of fruit and nuts available in the community. We recommend that in rural communities, public health campaigns should continue to focus on highlighting the importance of consuming a varied diet rich in fruits, nuts, and vegetables. Promoting the importance of dietary diversity for women's health should be a key focus of these campaigns. In addition to campaigns, public health authorities in urban areas should consider ways to increase the affordability of fresh foods, particularly fruits and vegetables, to bolster their consumption. Given that previous studies have shown a strong association between maternal (caregiver) and child dietary diversity (Amugsi et al., 2015; Bonis-Profumo et al., 2021; Nguyen et al., 2013), it is likely that such interventions would have the added benefit of improving health outcomes for children.

There is a clear need to bring a nutrition lens to fisheries management strategies for both wild-caught and farmed fish. Given the potential discrepancy in nutritional value between wild-caught and farmed fish (Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Fiorella et al., 2021), it would be useful to incorporate nutritional values for the range of fish (wild-caught and farmed; reef fish and pelagics) and invertebrates that women regularly consume to better understand the contributions of these different marine animal-source foods to women's nutrition. This information could then be used to inform more targeted public health campaigns and fisheries management strategies.

Conclusions

Fish has an important role to play in reducing the burden of malnutrition in Solomon Islands, and effective and equitable fisheries management will be key to realizing this potential. Our research found that women's diets in the study community are nutritionally inadequate and exhibit a heavy reliance on reef fish for nutritional security. We know that women's fishing contributes significantly to household nutritional security, as women's catch largely goes directly to feeding their families (Harper et al., 2013, 2020; Rabbitt et al., 2019; Thomas et al., 2021). There are clear links between gender and nutrition in the fisheries context, and community-based management plans need to approach management decisions in a way that is both gender- and nutrition-sensitive. This will require an understanding of the important role women's fishing plays in ensuring household nutritional security, and therefore an understanding of the potential consequences of management actions that lead to a reduction in women's fishing. Incorporating women's voices into fisheries management will result in more equitable access to resources and have positive flow-on effects for household nutrition. At a national level, it would be beneficial for policymakers working to address malnutrition to work collaboratively with those working toward sustainable use of marine resources, as one cannot succeed without the other. More research focusing on gender- and nutrition-sensitive approaches to fisheries management would bring a greater awareness to the interconnectedness of malnutrition and gender equity in the fisheries context and assist in progressing efforts to address both of these challenges.

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A feasibility study of the community health worker model for garden-based food systems programming

Maria DeNunzio [a] *
Virginia Tech

Elena Serrano [b]
Virginia Tech and Virginia Cooperative Extension

Vivica Kraak [c]
Virginia Tech

Melissa Chase [d]
Virginia Tech and Virginia Cooperative Extension

Sarah Misyak [e]
Virginia Tech and Virginia Cooperative Extension

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Abstract

Underserved communities, including those of Black, Indigenous, and people of color, experience unequal access to food systems resources and programming. Community health workers are lay public health workers from underserved communities who provide basic health services and culturally sensitive education while bridging social services and community needs. The objective of this study

[a] * *Corresponding author:* Maria DeNunzio, MS, Graduate Research Assistant and PhD Candidate, Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, Virginia. 330 Wallace Hall, 295 West Campus Drive, Blacksburg, Virginia, 24061 USA; mdenunzio8@vt.edu; https://orcid.org/0000-0001-7698-6732

[b] Elena Serrano, PhD, Professor and Extension Specialist, Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, Virginia; and Director, Virginia Family Nutrition Program (EFNEP and SNAP-Ed), Virginia Cooperative Extension; serrano@vt.edu

[c] Vivica Kraak, PhD, MS, RDN, Associate Professor, Food and Nutrition Policy, Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, Virginia; vivica51@vt.edu; https://orcid.org/0000-0002-9303-5530

[d] Melissa Chase, PhD, Consumer Food Safety Program Manager, Department of Food Science and Technology, Virginia Tech, Blacksburg, Virginia; mechase@vt.edu
Dr. Chase has retired since this evaluation was completed.

[e] Sarah Misyak, PhD, MPH, Research Assistant Professor, Department of Human Nutrition, Foods, and Exercise, Virginia Tech, Blacksburg, Virginia; and Assistant Director and Program Manager for Research and Evaluation, Virginia Family Nutrition Program (EFNEP and SNAP-Ed), Virginia Cooperative Extension; smisyak@vt.edu

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Author team members ES, MC, and SM were employed by Virginia Cooperative Extension during the project.

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was to determine if a community health worker model was feasible to deliver garden-based food systems programming with underserved Black, Indigenous, and communities of color for Virginia Cooperative Extension (VCE). Twenty-nine individuals from different programming areas and positions within VCE participated in semi-structured interviews using video-conferencing (Zoom) in 2021. Interviews were coded and analyzed with thematic analysis. The study found that the community health worker model is feasible for garden-based food systems programming for VCE. Themes identified include the fit of the community health worker model for VCE, cultural humility, and logistics. The community health worker model has potential to expand culturally relevant food systems programming and increase inclusion in VCE. Garden-based food systems programming with a community health worker model may create opportunities for interdisciplinary collaboration. The community health worker model is fit to advance the community well-being values of VCE through inclusive food systems programming. Food systems community organizations can use this study as a template to evaluate potential new community health worker positions for expansion of inclusive food systems programming.

Keywords
community health workers, health equity, food systems programming, feasibility study

Abbreviations
BIPOC: Black, Indigenous, and people of color
CHW: Community health worker
VCE: Virginia Cooperative Extension

Introduction and Literature Review

Food systems encompass the networks and interactions of processes that span food production to food disposal and include political, environmental, and social influences on processes in the food system (High Level Panel of Experts on Food Security and Nutrition [HLPE], 2017; Neff et al., 2009). Food systems are an important influence on population health; however, the distribution of and access to food systems resources are unequal. In the United States, communities of Black, Indigenous, and people of color (BIPOC) are often marginalized by the food system (Greene et al., 2022; Hines et al., 2022; Jernigan et al., 2017; Neff et al., 2009; Odoms-Young & Bruce, 2018; Satia, 2009). Disproportionate access to food systems resources can contribute to diet-related health disparities among BIPOC communities (Aaron & Stanford, 2021; Kris-Etherton et al., 2020; Warren et al., 2022). Despite examples of food systems programs that are inclusive to BIPOC communities (Mejia et al., 2020), the dominant food system and programming structures often exclude BIPOC communities (Conrad, 2020).

Community-serving institutions, such as Cooperative Extension (hereafter called Extension), deliver food systems programming as one approach to advance inclusion and health equity in the food system. Extension, the outreach branch of the land-grant university system, is a national network of state-administered outreach systems that translate research into information and programs to advance the well-being and prosperity of communities (National Institute of Food and Agriculture, n.d.). However, BIPOC communities often experience unequal engagement with food systems programming that may prevent the advancement of health equity goals and overall prosperity (Clark, Freedgood et al., 2017; Kumanyika, 2019; Lyson, 2014).

The resources, staff technical expertise, and social network integration of Extension in local communities can strengthen local and community food systems (Clark, Bean et al., 2017; Dunning et al., 2012; Morgan & Fitzgerald, 2014). Extension can increase access to and availability of food, increase community food security, and address health and wellness goals by supporting food systems education and programming at a community level (B. Braun et al., 2014; Gwin, 2019).

Garden-based programming has many health benefits and is an effective platform for launching food systems programming (Alaimo et al., 2016; Gregis et al., 2021). Garden-based programming also builds on a strong internal infrastructure and expertise on gardening within Extension that can translate into programming where community members learn about each food system process from production to disposal from Extension

employees or trained volunteers. The Extension Master Gardener program, founded in 1972, is a rigorous volunteer program that trains community members in gardening and horticulture knowledge and practice. The trained community members, or Master Gardeners, then reciprocate that training through a predefined number of community volunteer hours (Meyer, 2007). Master Gardener activities vary greatly across states and communities, and while a traditional role of Master Gardener volunteers is to assist in community gardening education, Extension professionals recognize that Master Gardener volunteers and programs can also advance community health (Dorn et al., 2021; Kowalski & Barrett, 2020). Participants in a pilot study in Alabama learned an adapted Master Gardener curriculum, then used their knowledge to work on food access projects in underserved communities (Randle, 2015). Master Gardener programs often do not represent the diversity of the communities they are meant to serve (Dorn et al., 2018) and this may be a reinforcing factor in the disparate access to Extension food systems programs by BIPOC communities.

Across the U.S., state Extension systems implement other master volunteer programs that are modeled from the Master Gardeners. Examples of master volunteer programs include Food (Bloom et al., 2021), Climate (Pathak et al., 2014), Compost (Tedrow, 2018), Wellness (Washburn et al., 2017), Financial Coach (Ehmke, 2020), Naturalist (Hildreth & Mengak, 2016), and Beekeeper (Breece & Sagili, 2019). Extension master volunteer programs benefit the community and the volunteers themselves (Washburn et al., 2017; Wilson & Newman, 2011). Master volunteers are important to Extension's outreach and can be partners in program planning and implementation (Washburn et al., 2020).

Master volunteer program evaluations also reveal a lack of diversity among volunteers as categorized by race, age, and socioeconomic status. Extension master volunteers, regardless of program area, are likely to be white, identify as female, hold a bachelor's degree or higher, and have an income of at least middle-class earners (Cunningham et al., 2021; Dorn et al., 2018; Hildreth & Mengak, 2016; Wilson & Newman, 2011). The Extension system recognizes that the current demographics of the master volunteer programs often do not match the demographics of many of the communities they serve (Washburn et al., 2017), and that the structure of master volunteer programs—extensive training requirements that conflict with full-time employment, costly applications, and rigorous certification requirements—exclude many underrepresented communities. It is imperative to increase volunteer diversity to fully realize the potential of Extension master volunteers for equitable outreach and community education.

This formative study includes the Master Gardener and Master Food volunteer program because food gardening programs could partner with the Master Food Volunteers to deliver food systems programming that addresses food production, preparation, and basic nutrition information. Lay outreach individuals have previously conducted garden-based food systems programming to bridge social service systems and underserved communities (Barnidge et al., 2015; Stluka et al., 2019).

The community health worker (CHW) model is a lay health outreach position that most commonly provides basic health services, health education, and health promotion to reach underserved communities in the U.S. (Olaniran et al., 2017; Scott et al., 2018). CHW programs often work with diabetes education, cancer screening, and health promotion to mitigate chronic disease such as hypertension (Campbell et al., 2020; Liu et al., 2021; Pasha et al., 2021). During the COVID-19 pandemic, CHWs conducted outreach in BIPOC communities to connect families with contact tracing, social services, and home care for COVID-19 (John et al., 2022; Moir et al., 2021; Rosenthal et al., 2020). CHWs are unique within public health because many CHWs are members of the communities they serve, giving them a deep understanding of the sociocultural characteristics of their priority populations (American Public Health Association, 2009). This cultural knowledge positions CHWs to advance health equity for vulnerable populations by connecting their communities to health systems and services (Olaniran et al., 2017; Perry et al., 2014). While CHWs in the U.S. most often work in health education and promotion, the CHW model

has also been used in food systems programming to expand access to food systems resources within vulnerable communities (DeNunzio et al., 2022).

Improved inclusion of BIPOC communities in Extension programming will also advance Extension's efforts to expand its impact in community change and health promotion (Farella et al., 2021; Fields & Nathaniel, 2015; Linnell et al., 2020; Webster, 2021). Expanding equitable access to Extension services for all community members requires an exploration of new approaches to inclusive programming. Given the need for Extension to promote health equity for BIPOC communities (Farella et al., 2021; Fields & Nathaniel, 2015), and given the proven success of the CHW model to connect with BIPOC communities (Liu et al., 2021; Pasha et al., 2021; Rosenthal et al., 2020), a feasibility study of using a CHW model for VCE for garden-based food systems programming was warranted.

Purpose of Study

The purpose of this evaluation was to determine if a CHW model was a feasible model for future implementation in VCE to expand reach to underserved audiences for garden-based food systems programming. The four objectives were to explore:

1. How the CHW model aligns with VCE values and programming goals;
2. Potential CHW training integration into the current structure of VCE Master Gardener and Master Food volunteer training;
3. Programming logistics of garden-based food systems education through a CHW model;
4. Specific populations that VCE professionals believe are suitable to engage with CHW-delivered programming.

Methods

The feasibility study was a formative evaluation conducted using qualitative semi-structured interviews in 2021.

Study Design

This qualitative evaluation project explored the feasibility of the CHW model for VCE garden-based food systems programming. The findings are specific to VCE. The Virginia Tech Institutional Review Board designated the project as "not research" in May 2021. We refer to the project as a feasibility study throughout the manuscript. Semi-structured interviews were the qualitative method used to answer the study objectives.

Data Sources

Participants in the semi-structured interviews generated the data for the qualitative project. Semi-structured interview participants shared perceptions on the feasibility of the CHW model for garden-based food systems programming for VCE and those perceptions were captured in recorded Zoom sessions and then analyzed using the procedures detailed below.

Recruitment of Participants

The first author conducted 29 semi-structured interviews with VCE stakeholders from June to October 2021 via video-conferencing (Zoom). Interviews were scheduled according to participant availability. There was often a period of days or weeks in which no interviews were conducted due to the snowball sampling method. Each new participant had to agree to participation and have availability for the interview. The data collection period was five months due to the busy schedules of the Extension professionals who participated in the study.

Key stakeholders were defined as any VCE professionals with a position or knowledge relevant to understanding the feasibility of a CHW model for garden-based food systems programming for VCE. Author team members, many of whom are VCE program administrators, identified initial key stakeholders (n = 19) for interview participation. The first author emailed each of the 19 pre-identified stakeholders between June and August 2021 to request participation in a semi-structured interview. Twelve participants completed interviews following the initial recruitment email. Two of the pre-identified stakeholders declined to participate and five did not respond to two recruitment emails.

An additional 42 potential participants were identified using snowball sampling. Of these 42

potential participants, the first author emailed 24 participants with the standardized recruitment email. Individuals were recruited to represent each planning district, programming area, and urban, rural, and suburban areas of Virginia. One individual declined, seven were nonrespondents, and 16 participants completed interviews. Recruitment and data collection occurred concurrently, as interviews were scheduled based on participant availability. All participants were recruited via a standardized email and each participant gave verbal permission to record the Zoom video interview. The author team included Master volunteer program administrators as key stakeholders because of their positions as statewide leaders for the Master Food and Master Gardener volunteer programs, both of which were identified during study design as important for garden-based food systems programming within VCE. Supplemental Nutrition Assistance Program-Education (SNAP-Ed) administrators, agents, and program assistants were recruited for similar reasons. SNAP-Ed is the nutrition education arm of SNAP, and VCE SNAP-Ed stakeholders were included in the initial list and subsequent snowball suggestions by participants because VCE administers SNAP-Ed programming in Virginia. The author team included family and consumer science agents in the initial participant list. Initial interview participants suggested that agriculture and natural resources agents participate in semi-structured interviews during the snowball sampling. Table 1 lists the number of participants in each stakeholder group interviewed.

Table 1. Number of Participants from Eight VCE Stakeholder Groups Who Participated in the Semi-Structured Interviews

Stakeholder group	Number of participants
VCE master volunteer program administrators	3
Virginia SNAP-Ed administrators	3
VCE specialists with relevant expertise	3
VCE state leadership	3
Family and consumer science agents	5
Agriculture and natural resources agents	8
SNAP-Ed agents	3
SNAP-Ed program assistants	1

Instrumentation

The author team designed the semi-structured interview scripts for the administrators of the Virginia Master Gardener Volunteer, Master Food Volunteer, and SNAP-Ed programs using a five-phase process (Kallio et al., 2016). The following paragraphs describe the five phases.

Phase 1: Identify the prerequisites for using semi-structured interview

The authors selected the semi-structured interview method because the perceptions of the interviewees were important to understand the study objectives (Barriball & While, 1994).

Phase 2: Retrieve and use previous knowledge

The author team includes experts in food systems, health equity, and Extension, and applied this collective knowledge to develop the semi-structured interview guide.

Phase 3: Formulate the preliminary semi-structured interview script

The interviewer asked participants in each stakeholder group open-ended, participant-oriented questions that were framed with who, what, where, when, how, and why to answer the study objectives. Follow-up questions and probes were both included in the script and arose naturally during the interviews.

Phase 4: Pilot testing of the semi-structured interview script

Author team members who are Extension specialists conducted an internal review of the semi-structured interview scripts for the Master Food and Master Gardener volunteer program administrators. The first author, who was responsible for recruitment and data collection, conducted a mock interview with a VCE program administrator using the Master Food volunteer program administrator script. Pilot testing demonstrated the appropriateness of the interview question content, length of script, and reading level of questions. Through the pilot testing

process, the author team decided to use a conversational approach in the interviews.

Phase 5: Presenting the complete semi-structured interview script

VCE specialists approved the scripts for the master volunteer program administrators prior to participant recruitment. Two authors (MD and SM) adapted the program administrator scripts for agents, specialists, program assistants, and state leadership throughout the recruitment and data collection process.

Table 2 shows a sample of key questions with selected probes included in the interview scripts. Each script included six primary questions with three or four probes per question, as well as a brief explanation of the project and a definition and examples of CHWs. The interview questions varied slightly in wording between stakeholder groups, such as asking Extension agents about support needed from program administrators. Agents are field faculty responsible for Extension program implementation and partnership development. Each script concluded with the interviewer asking the participant if there was anything else they would like to share.

Data Collection

Interviews were conducted via Zoom. Participants gave verbal permission to record the Zoom session. Interviews began with informal greetings and verbal permission for recording. The interviewer then read a short script describing the project and the CHW model and asked if the participant had any questions. The interviewer proceeded to ask each of the questions included in the interview script. The tone of the interviews was conversational, and the tempo of the interview was participant-driven. The interviewer was trained to probe for additional details and to allow reflection by the participant. Interviews lasted an average of 42 minutes.

Data Analysis

The Zoom recording auto-generated a transcript from each video interview. The first author (MD) edited the Zoom-generated transcripts by listening to the recording and correcting the Zoom-generated transcript to match the recording. Contextual and nonverbal communication, such as pauses and punctuation, were added during transcription using a denaturalized approach (Azevedo et al., 2017; Bucholtz, 2000). The first author removed or re-named identifying information during transcription, such as names and places (e.g., northern area of Virginia).

Two authors (MD and SM) conducted data analysis using methods adapted from Creswell and

Table 2. Selected Key Questions Included in the Semi-Structured Interview Scripts

	Question stem	Selected probes
Q1	What are your goals for food systems programming in the coming years?	N/A
Q2	How do you see a CHW model integrating into your current food systems work?	How could a CHW model work with the Master Gardener program? How could a CHW model work with the Master Food volunteer program? How could a CHW model work with the existing program assistant structure?
Q3	How can food systems programming be more accessible and marketable to diverse populations? In this project, diverse populations represent the communities I mentioned earlier: racial and ethnic minorities, immigrants and refugees, and families and individuals with low income.	How can the local knowledge carried by a CHW be leveraged and valued in Extension programming?
Q4	What populations are difficult to engage in food systems programming? And why?	N/A

Poth (2018) and Braun and Clarke (2006). The study objectives guided the development of an initial deductive codebook (n = 15 codes). Two authors independently coded two transcripts with the initial codebook, then refined the initial codebook in an iterative process on multiple passes and transcripts until agreement was reached on the final eight codes. Deductive codes represent the variables of interest from the study objectives and inductive codes were agreed by the two coders as emergent from the data. Table 3 displays the final eight codes and their definitions: intention, participatory development, cultural relevancy, logistics, community partners, participants, accessibility and inclusivity, and terminology. The coding was performed in Microsoft Word using memo-ing techniques adapted from Creswell and Poth (2018). The first author (MD) coded all 29 transcripts. A second author (SM) independently coded 11 transcripts, including at least one from each stakeholder group. Consensus determined intercoder agreement and the two authors discussed disagreements. A similar intercoder agreement process was applied during the codebook creation to generate agreeable code names and definitions. The coded Word documents were uploaded to Taguette, an open-source qualitative research tool (Rampin & Rampin, 2021) for data analysis.

The coded extracts were organized in Microsoft Excel into themes and subthemes identified from the data. Following the procedures of (V. Braun & Clarke, 2006), two authors (MD and SM) discussed how the coded extracts represented inductive themes and collaboratively determined the three major themes listed in the results section. Two authors determined themes by reading the coded extracts and noting potential themes, then reviewing themes and combining and renaming where necessary.

Table 3. Final Codebook with Codes and Definitions Applied to the Interview Transcripts

Codes	Definitions
Intention	Purpose of VCE in the community, including goals, objectives, and intention of new and existing programming. VCE organizational messaging. Approach to work and direction of efforts by both organization and individuals.
Participatory Development	Opportunities to integrate local knowledge from CHW, to co-create programming.
Cultural Relevancy	How a CHW may influence factors in ensuring that a program and environment is comfortable and welcoming to underserved populations.
Logistics	How a CHW for garden programs fits into VCE structures, including collaborations, support, and supervision for the CHW. CHW work topics, job description, and position expectations. Training and compensation considerations for the CHW and VCE professionals. Needs of VCE professionals to work with CHW, including skills, resources, or capacity-building. How a CHW model may influence factors on the establishment, implementation, and sustainability of a garden-based program for food systems.
Community Partners	Community organizations or individuals not employed by VCE that are relevant to the feasibility of a CHW model. May be mentioned in the recommendations of potential participants in programming.
Participants	Communities, individuals, or groups that may be suitable to engage in programming delivered by CHW, to serve as CHW for VCE or who may be missed by current VCE efforts.
Accessibility and Inclusivity	How the CHW model may affect or relate to structural inequities in the food system and how the effect of paternalism in food systems work can affect the CHW model. Cultural competency of current VCE programming. Factors, both internal and external to VCE control, that influence accessibility of current VCE programs, including socio-cultural demographics of VCE professionals and volunteers and the public image of VCE.
Terminology	Thoughts about the title of community health worker and the implications of the term "community health worker."

Author Positionality

The author team includes several Extension professionals who are state-level faculty for Extension programs included in this feasibility study. We believe that Extension has an important role in community well-being and work to ensure that Extension services are equitably accessible within communities. We believe that community assets are important to strengthening the role of Extension in promoting community well-being. The first author conducted recruitment and data collection and did not have previous professional connections with the participants. The authors who developed the codebook and conducted data analysis, including coding of interview transcripts, are white women with advanced degrees who work at a large university.

Results

Thematic analysis of the stakeholder interviews generated three major themes: (a) fit of the CHW model within VCE; (b) cultural humility; and (c) logistics. Each theme partly addresses some or all of the four objectives. The discussion and conclusions section contains overall findings and conclusions. Although eight stakeholder groups participated in interviews, the quotations included in this article are attributed to the broad categories of state faculty, agent, and SNAP-Ed to protect interview participant identities.

Theme 1: Fit of the CHW model within Virginia Cooperative Extension

Participants recognized disproportionately low access to programming by populations underserved by the current food system and the CHW model as a potential avenue for extending the reach of VCE programming to new audiences. Participants were receptive to a CHW model in part because they viewed VCE as a credible community-health serving organization, especially to improve food access and address food insecurity. Participants referenced food systems teams and initiatives within VCE and alluded to their goals to advance inclusion in food systems programming and to develop food systems that more equitably serve community needs:

> We have food systems goals, one of which is to not just deliver new programming, but to build understanding and collaboration across Extension to do food systems programming better. … What we need to do is think more about systems work and values-based work, meaning it's not just about the technical work. … How do we address issues like food security and social justice and fairness in our communities. —*State faculty*

Participants shared examples of their current food systems programming and how a CHW model could extend the impact of current efforts to be more attentive to and inclusive of underserved audiences. One agent shared, "Another layer so [that] communities won't be left out … that this community health worker would pull the net tighter where it's kind of loose right now."

Participants stated that the CHW model serves the mission and values of VCE and can advance the connection of VCE programming to the needs of underserved communities. Participants welcomed the CHW model as an avenue to learn about diverse cultures and design programming to serve the community needs, in alignment with the mission of Extension:

> This idea of the teach back … where it's not just a one way street of communication … [We are] capturing the stories of food. In a way that highlights resilience and different ideas of health, capturing all that cultural stuff. —*SNAP-Ed*

The term "community health worker" led participants to unclear expectations about the potential job responsibilities of a CHW within VCE, as participants presumed that the CHW would work in a healthcare-focused position and program to address health promotion and disease prevention or management.

> Coming from a healthcare worker and dealing with how food can act as … medicine. … Helping the people … see that it's better to eat a butternut squash instead of a pop tart … understanding the importance of what you're eating and your health. —*Agent*

Some participants suggested that a terminology change from "community health worker" as a job title could assist with the integration of the CHW model into the VCE system programming structure:

> The term would require clarification to recruit somebody. To call somebody a health worker implies that they are either trained or certified in some form of health education or are going to receive extensive education that will protect them from liability, particularly if they are giving advice about health. The name is problematic. —*Agent*

Theme 2: Cultural humility

VCE professionals were confident in their technical skills to deliver garden-based food systems programming; however, there was widespread recognition that integration of the CHW model into programming must include cultural humility (Tervalon & Murray-Garcia, 1998).

Participants recognized that the CHW model is an opportunity to expand their own learning about ethnically and racially diverse cultures to better serve all Virginia residents:

> That community health worker has got the knowledge that we don't have … that cultural knowledge … if we want to be successful, we need to be open to being educated by that individual as these are the things that my community enjoys and these are the things that they don't enjoy…it doesn't do us any good to provide education on growing X, Y, Z crop if we learn from that community health worker, that culturally, that's not a big part of their diet. What it boils down to is utilizing the wisdom of those community health workers out in their communities … and in turn, they can help us develop programs that are more likely to meet their needs. —*Agent*

Participants recognized that the lack of representation within VCE and its master volunteer base affects both the inclusion of participants from BIPOC communities and the capacity of current volunteers and professionals to program with all members of their communities.

> It is a challenge to take individuals and volunteers from my program into ethnic communities where they look different from the majority of the people who work, who live there, who participate in those activities. … Sometimes I have a harder sell that way to promote our programs to what we call underserved audiences. —*Agent*

Agents and state-level staff were confident in their abilities to build partnerships and listed several examples of partners that could connect VCE to communities well suited for CHW-delivered programming, such as faith-based organizations, low-income housing managers, and cultural community center directors. Leaders of these organizations were often identified as champions of the communities they serve, and interview participants recognized that authentic relationships with community champions are key to impactful and culturally appropriate programming.

> Having people that are connected within those communities, where they could have those one on ones.… A lot of times you have that trusted person who can really speak the language … not even like a language dialect, like they live there, so they know who they are and you know that they are trusted. —*Agent*

VCE professionals were reflective on how they work with diverse audiences. Participants acknowledged their own biases and privilege and expressed desire to improve cultural competency, accessibility of programming, and connections with diverse audiences.

> Why, if you're a member of a minoritized segment of the local community, why is it that they do not feel like they can see themselves as an Extension Master Gardener volunteer, because, from our perspective, we do want it to be available to anybody that has an interest. But there are obviously some barriers either unseen … that are impeding people's willingness to participate or join in, and if there are things that we

> can do to remove those barriers, that's what we are attempting to do. —*State faculty*

Participants suggested the use of participatory methods in program planning and evaluation and the co-creation of curricula with CHWs to ensure cultural relevancy, especially as it relates to food and gardening.

> I would co-create with this person, what do we want, what do you feel is misunderstood. And what do I feel is misunderstood by your population. … Where are the gaps in both of our knowledge, so that we can create a curriculum together around what is not understood … cooking, tasting different things, identifying things that are not accessible or are really strong pillars of that [culture] … like celebrations, when are these foods eaten. … There's a whole spectrum of knowledge that could be touched on, to make it more exciting. —*SNAP-Ed*

Theme 3: Logistics

Agents and state leaders were receptive to working with a CHW to serve as a garden champion and especially welcomed the additional staff time a CHW would provide to extend the programming capabilities of agents. Participants agreed that the CHW model should primarily be in the purview of family and consumer science programming. Agriculture and natural resources professionals were amenable to be a technical resource for gardening information and to collaborate in planning; however, state administrators and field faculty recommended that family and consumer science agents should work most closely with CHWs. Family and consumer science and agriculture and natural resource agents all supported the CHW model as an interdisciplinary connector between traditionally separate programming areas.

> A lot of us are identified by agriculture and natural resources, family and consumer science, 4H, SNAP-Ed, so those themselves are really siloes. And we have specific programs that we're trying to do so, I could see that health worker really helping bridge the gap and working with all four of those agents … and the volunteers that already exist and agents going with the health workers to reach a specific community. —*Agent*

When asked how they envisioned a CHW fitting into the VCE structure, interview participants recommended that the CHW be an equal partner in program design and evaluation and be included in VCE leadership.

> We have something already in place Extension Leadership Councils, boards, committees. These folks certainly need to serve on, so their voice can be heard there, so they bring concerns, as well as recommendations from their community base. —*Agent*

Agents and state leaders expressed that Master Gardeners and Master Food volunteers are well suited to assist with CHW-led programming and to serve as training aides for the CHW. Participants believed the CHW model could effectively integrate into the Virginia SNAP-Ed structure. Peer educators, titled program assistants, already deliver SNAP-Ed programming, so a CHW could fit as a gardening-specific peer educator. SNAP-Ed professionals agreed that there must be delineation between responsibilities of existing program assistants and the CHW. SNAP-Ed agents and administrators expressed support for partnering CHWs and master volunteers in training and program delivery.

> They could be a different type of program assistant, could be like a gardening program assistant. … Or we could hire it under the SNAP-Ed agents and agent may supervise them if it's a part-time person, and that person works mainly just with gardening programming in the community. —*SNAP-Ed*

SNAP-Ed participants stated specific resource assets and needs that may influence the integration of the CHW model into the SNAP-Ed program:

> We can provide more than adequate

> gardening training for [the CHW]. I can see Master Gardeners helping provide that training and possibly even Master Food volunteers helping to train. The compensation model, I would assume they may be a staff position within the university and they would be compensated at a pay band similar to a program assistant, or the one above it. —*SNAP-Ed*

Participants stated that training elements for the CHW should include technical aspects of gardening and the expectations of the position within VCE, including the resources available to support the CHW. Training must be delivered in a setting that is accessible to potential CHWs: consider the time of day, the setting, the language of delivery, methods of instruction, and the cultural competency of the training administrators. Participants recognized their own need to increase cultural humility and expressed that they would need diversity and inclusion or cultural competency training to better collaborate with a CHW and apply participatory methods in program planning and evaluation.

> You can get all kinds of information on how to grow tomatoes or peppers or fruits. … Where our energy is going to be best spent is trying to develop a genuine relationship with those community health workers that's based on trust. … From our perspective, we would be well served as an organization to come into these things with a lot of humility versus us coming in, as the so called experts and we're going to train you, community health worker, so that you can go out there and help your community, we would do well to listen more than we speak and take it from there. —*Agent*

Participants either asked about the compensation range for the CHW or stated that it may not be feasible to recruit and retain individuals from underserved communities and train to the level required for a successful garden-based food systems program without compensation. A part-time paraprofessional with a flexible work schedule was widely recommended.

> Offering it as a paid position … the pool would be greater, and you could retain somebody in the position a little bit more. —*SNAP-Ed*

> If it were done so that CHWs … it was their job and they are 80% time or something, that could work,… but there would have to be formative work to be sure that it's not going to negatively affect our volunteer program. —*State faculty*

Participants identified a need for programming and materials to be available in languages other than English. Spanish-language programming was identified as the most widespread need. Some participants rely on community partners to aid in non-English programming; however, there was recognition that internal Extension resources for diverse language options would expand inclusivity and accessibility of programming:

> We really need folks that can speak the language. That's helpful if there is someone who is bilingual to serve as that community health worker to help interpret. Same thing for translation of our materials, that can be really challenging to get materials translated into the languages that we need. We're seeing an increase in requests for materials to be translated into languages we haven't worked with before. —*State faculty*

Discussion

The purpose of this formative study was to determine the feasibility of the CHW model for garden-based food systems programming within VCE. The results demonstrate that the CHW model is a feasible model for VCE to implement for inclusive garden-based, food systems programming. The author team prepared a short report of the results and shared it with interview participants in March 2022.

The history of the CHW model working with underserved audiences (Kim et al., 2016) provides additional support to the assertations of VCE stakeholders that the CHW model can be a tool for inclusive food systems programming. VCE partici-

pants immediately recognized the importance of food as culture and the potential of food to connect marginalized communities, thus extending previous findings by Cachelin et al. (2019) and Eggert et al. (2015). Although the work of Gonzalez et al. (2021) was focused on opioid prevention programming, many of the same best practices shared for engaging BIPOC communities in Extension programming were expressed by interview participants: understanding the needs within each community, recognizing and examining personal biases, and nurturing meaningful relationships. This overlap in recommendations for inclusive practices suggests that the CHW model and the integration of local knowledge is a good fit for the values of VCE. The recognition of food as culture and the amenability to participatory programming aligns with calls to shift Extension programming from traditional direct education to a collaborative partnership with community members (Strong et al., 2015; Washburn, 2017).

Cultural humility is a long-term commitment to learning with and from people with identities different than one's own, working to combat power differentials, and building mutually beneficial partnerships across identity divides (Tervalon & Murray-Garcia, 1998). Cultural humility is distinct from cultural competence in that cultural humility recognizes power structures between identities, acknowledges racism and discrimination, and is focused on learning and collaboration (Foronda, 2020; Gopalkrishnan, 2019). Cultural competence generally refers to a skill set that allows individuals to work within and across cultural identities in a respectful and understanding manner (Betancourt et al., 2003). The concept of cultural humility best represents the emergent theme from the stakeholder interviews in this evaluation.

Food systems are complex and span many different VCE programming areas. If the CHW model were to be implemented throughout Virginia, VCE should consider integration of existing training materials across agriculture and natural resources and family and consumer science programs. State leaders should construct a foundational training package but allow for some modifications at the local level, especially pertaining to specific plants and foods to ensure cultural relevancy. The Master Gardener Volunteer, Master Food Volunteer, and Urban Agriculture Certificate programs are positioned to provide training and curricula support. Many participants reflected on the opportunity that garden-based food systems programming provides for interdisciplinary collaboration, and recognized the need for teams to work on solutions to complex problems, such as those found in the food system. Extension is an important and relevant stakeholder for designing community solutions to complex societal problems. The frameworks for interdisciplinary programming within the Extension literature (Guion, 2010; Holland et al., 2019) are a testament to the growing demand for integrated programming. The needs of garden-based programming varies across local contexts, and the CHW model may provide a mechanism to address representative leadership needs (Gilbert et al., 2020).

Across the Extension system, professionals are developing methods to formalize diversity and inclusion efforts and build capacity for Extension to equitably partner with diverse constituencies of the community (Bertsch et al., 2020; Chazdon et al., 2020; Walcott et al., 2020). In recognition of the structural barriers that often exclude underserved communities from volunteering (Southby et al., 2019), the prevailing recommendation among VCE stakeholders was that a CHW model should be implemented as a paid paraprofessional position. VCE stakeholders recognized that current master volunteer groups lack racial and socioeconomic diversity, and this internal recognition is supported by a 2016 national survey of Master Gardener volunteers in which 93.7% of respondents identified as white and more than 70% of respondents reported an annual household income of more than US$50,000 (Dorn et al., 2018). The CHW model has potential to connect racial and socioeconomically diverse audiences to VCE; however, participants stated that the CHW model will have more likelihood of success if it is implemented with monetary compensation. As food systems organizations conduct feasibility studies and design CHW positions, they should assess appropriate compensation for the positions. Some participants offered suggestions for compensation packages, but each

organization should design compensation packages to fit their specific needs and resources. Within VCE, the expectations of the CHW position must be clearly established so they are not competitive with the master volunteers or paraprofessional program assistants. Program planning for a CHW position should assess how implementation of a compensated CHW position may affect recruitment of master volunteers, and should take care that the CHW position does not compete with master volunteer recruitment. VCE should explore funding models that are appropriate for the local expectations and context of the CHW position.

While this project was specific to VCE, it provides an example for other community-serving food systems organizations. Given that the CHW model has been used in food systems programming (DeNunzio et al., 2022), food systems organizations can use this assessment to guide their own feasibility studies as they consider the creation and hiring of food system practitioner positions or initiatives to advance inclusive programming. Findings from this study and recommendations for food justice gardening programs (Porter, 2018) should be considered as organizations determine the feasibility of the CHW model for food systems programming within their individual structures, values, and goals.

The title of "community health worker" was misleading for participants, and it was recommended that a different job title be applied to the position for implementation in food systems programming. Interview participants assumed that the CHW model would be implemented to conduct programming on health education, disease prevention, and healthcare navigation, rather than the intended implementation to expand food systems programming in underserved communities. While these perceptions demonstrate a real or perceived need for VCE to provide health and disease programming, they also demonstrate that VCE must use a title other than "community health worker" for the CHW model to alleviate confusion on work expectations. Further research should explore the coupling of a CHW model to Extension health programming, especially as Extension expands efforts in community health and systems change (Harden et al., 2020; O'Hara-Tompkins et al., 2021). Future research could also explore how Extension could partner with other community-serving organizations to develop and deliver CHW-led food systems programming. This research could include investigations into how partnerships can work to conduct programming in languages other than English, as an important role for the CHW may be to serve as a translator.

Limitations

The qualitative nature of this project limits the generalizability of the findings and thus it is important that other community-serving food systems organizations conduct their own tailored feasibility studies. Despite recruitment efforts, state-level leadership for VCE did not participate and share input. Youth-focused professionals were excluded from this evaluation *a priori*, but many interview participants stated that garden-based programming is a good fit for youth and can easily extend to families with children. Likewise, initial interviews excluded school gardens from the scope of questions, yet school gardens were repeatedly mentioned by participants as established community settings that could be a programming area for the CHW. Expanding this formative work to include youth-focused programming efforts is a potential next step for practitioners and researchers.

The finding that the title of "community health worker" was not acceptable for a food systems focused individual may have influenced the perceptions of VCE interview participants on how to best integrate a CHW position. Interview participants suggested that the CHW model fits with family and consumer science programming; however, the inclusion of the word "health" in interview questions may have biased answers, because current health programming is within family and consumer sciences. Food systems and garden-based programming may fit within agriculture and natural resource structures, and VCE should explore how a title other than "community health worker" for a food-systems focused individual may change the integration of the CHW model.

Conclusions

The CHW model for garden-based food systems programming is an appropriate fit for the values

and structure of VCE, provided the model is implemented with different terminology. Food systems is an interdisciplinary programming area that can improve the inclusion of underserved BIPOC audiences and advance equity through participatory programming. The values and structures of VCE are unique to Virginia. Other state Extension systems, as well as community-serving food systems organizations, should explore the feasibility of a CHW model within their own values and structures. Programs that contain elements of the CHW model, such as deploying educators who share socio-cultural characteristics with the priority population, already exist in Extension throughout the United States for health promotion topics such as diabetes management, healthy lifestyles, and anger management (Hardison-Moody et al., 2011; Kaiser et al., 2009; Kaufman et al., 2017; Tiret et al., 2018). The implementation of a CHW model for garden-based food systems programming would integrate outreach and programming efforts already occurring across the Extension system, in order to use a best practice for inclusion of underserved populations so that disparities in food systems can be addressed.

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Does participation in livelihood education programs impact household food security? A comparative study in rural Uganda

Samuel Ikendi,[a] * Francis Owusu,[b] Dorothy Masinde,[c]
Ann Oberhauser,[d] and Carmen Bain [e]
Iowa State University

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Abstract

Food and nutrition security projections from global to household levels show that the future requires multifaceted approaches to achieve desired goals. In Uganda, the government has tried several strategies to promote food production, including a public-private partnership with Iowa State University through its Center for Sustainable Rural Livelihoods. In this comparative study, we surveyed 454 households to explore whether participation in livelihood education programs (LEPs) impact household food security. We also determine which LEPs and household characteristics influence food security. Overall, 46.3% of the surveyed households were food secure, while the remaining were insecure or extremely insecure. Significantly, 51.0% of LEP participants were more food secure, compared to 35.5% of nonparticipants. Specific LEPs

[a] * *Corresponding author*: Samuel Ikendi, Master's candidate, Community and Regional Planning, co-major with Sustainable Agriculture, Iowa State University. Samuel is now a doctoral graduate of Agricultural Extension Education, Iowa State University and is an Academic Coordinator for the USDA NIFA-funded Climate Smart Agriculture Project, Agriculture and Natural Resources, University of California; 5200 North Lake Road; Merced, CA 95343 USA; +1-209-228-4400; sikendi@ucanr.edu

[b] Francis Owusu, Professor and Chair, Department of Community and Regional Planning, Iowa State University; fowusu@iastate.edu

[c] Dorothy Masinde, Teaching Professor, Department of Horticulture, Iowa State University; masinde@iastate.edu

[d] Ann Oberhauser, Professor, Department of Sociology, Iowa State University; annober@iastate.edu

[e] Carmen Bain, Associate Dean for Academic Innovation, College of Agriculture and Life Sciences, and Professor, Department of Sociology; Iowa State University; cbain@iastate.edu

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including agronomy and postharvest technologies, and livestock integration significantly influence food security, but less so for programs on nutrition and infant feeding, water supply and public health, complementary services like therapeutic porridge and assistance with immunization, and income innovations. Multinomial logistic regression analysis revealed that the household characteristics of keeping livestock and the number of meals eaten during periods of scarcity, influenced households having more food security than insecurity or extreme insecurity. Households participating in LEPs, having larger acreage of land, and having clean water and sanitation facilities were more food secure. The time taken to fetch water, days of illness of male adults, and belonging to community social groups, also influence the level of household food security. Based on these findings, we recommend that households should participate in LEPs to build their capacity to manage crop and livestock production, and also to acquire knowledge of nutrition and feeding, public health, and income innovations.

Keywords
agronomy and land use, food and nutrition security, grain storage and postharvest, income innovations, livelihood education programs, livestock integration, nutrition education centers, nutrition and infant feeding, water supply and public health

Abbreviations
Center for Sustainable Rural Livelihoods, Iowa State University (CSRL)
Food and Agriculture Organization of the United Nations (FAO)
Food and nutrition security (FNS)
Food and Nutrition Technical Assistance (FANTA)
Food security status (FSS)
Global Hunger Index (GHI)
Household Food Insecurity Access Scale (HFIAS)
Iowa State University (ISU)
Livelihood education programs (LEPs)
Nongovernmental organization (NGO)
Nutrition Education Center (NEC)
Uganda Bureau of Statistics (UBOS)
Uganda Food and Nutrition Strategy (UFNS)
Water, sanitation, and hygiene (WASH)

Introduction

Food and nutrition insecurity is an ongoing and severe global problem, despite attempts by organizations and governments to mitigate it (Food and Agriculture Organization of the United Nations [FAO] et al., 2022; 2023). The Sustainable Development Goals (SDGs) set in 2015 by the United Nations to be achieved by 2030, calling for an end to hunger in all forms among all people and for access to nutritious and adequate food throughout the year (United Nations, 2015), began on an unfortunate note: one year after the SDGs were announced, the number of designated hungry people globally increased—from 794.6 million in 2015 to 804 million in 2016 (FAO et al., 2018). Due largely to the impact of the COVID-19 pandemic, the number of food-insecure households has further risen: "Nearly 670 million people will still be facing hunger in 2030—8 percent of the world population, which is the same as in 2015 when the 2030 Agenda was launched" (FAO et al., 2022, p. xiv). The FAO warns that "if we do not redouble and better target our efforts, our goal of ending hunger … by 2030 will remain out of reach" (FAO et al., 2023, pp. vii), particularly in the face of extreme climate variability, economic contractions, and the Ukraine-Russia conflict causing supply disruptions.

In Uganda, food and nutrition insecurity is one of the major factors impeding its development. Uganda ranks among the most ill-nourished nations (von Grebmer et al., 2022). In the 2021 Global Hunger Index (GHI), Uganda was among 15 countries with incomplete data but was rated as having "serious" hunger severity, a rating it had in 2020 as well (von Grebmer et al., 2022). In the 2022 GHI report, child stunting in Uganda was estimated at 25.4%, wasting at 3.6%, and undernutrition at 41.0%, a dire food and nutrition situation (von Grebmer et al., 2022). Conflict is one of the main predictors of hunger and undernourishment (FAO, Economic Commission for Africa et al., 2021; FAO, International Fund for Agricultural Development et al., 2021; FAO et al., 2023), and violence characterized the general electioneering

periods in Uganda (Ahluwalia, 2021). Ethnic conflicts (Sseremba, 2020) and rebel movements in Rwenzori (William, 2020) and Northern regions (Adong et al., 2021) have disrupted crop and livestock production, causing acute food insecurity in affected areas.

Most people in Uganda are rural-based and get their livelihoods from agriculture, the backbone of the economy (Uganda Bureau of Statistics [UBOS], 2016). Agriculture is dominated by small-scale landholder farmers operating at a subsistence level, with over 50% of their output used for home consumption (UBOS, 2016). Agricultural production in Uganda is highly dependent on nature's vagaries, particularly the weather and soil fertility. Food insecurity occurs when insufficient rainfall dries crops and pastures, excessive rainfall causes floods, and destructive pests and plant diseases prevail. In general, low food production explains the high level of food and nutrition insecurity in Uganda, and the prediction for the current path scenario is that Uganda may not achieve food security by 2050 (Hedden et al., 2018). The difficult circumstances exacerbating undernourishment are not new to Uganda. Government and global stakeholders have tried several strategies to promote food production and reduce food and nutrition insecurity, including the 2003 Uganda Food and Nutrition Strategy (UFNS). After the passage of UFNS, an investment plan for achieving its stated goals was drafted (Ministry of Agriculture, Animal Industry and Fisheries & Ministry of Health, 2004). The ministries of local government, health, agriculture, finance, and the Office of the Prime Minister committed their full collaborative support to its implementation. One of the strategies in the UFNS was promotion of private-public partnerships, a strategy adopted and adapted by Iowa State University in 2003 through its Center for Sustainable Rural Livelihoods (CSRL), a program to uplift the livelihoods of communities in rural Uganda (Butler & McMillan, 2015; Ikendi & Retallick, 2023a; 2023b).

Iowa State University and the Center for Sustainable Rural Livelihoods in Uganda

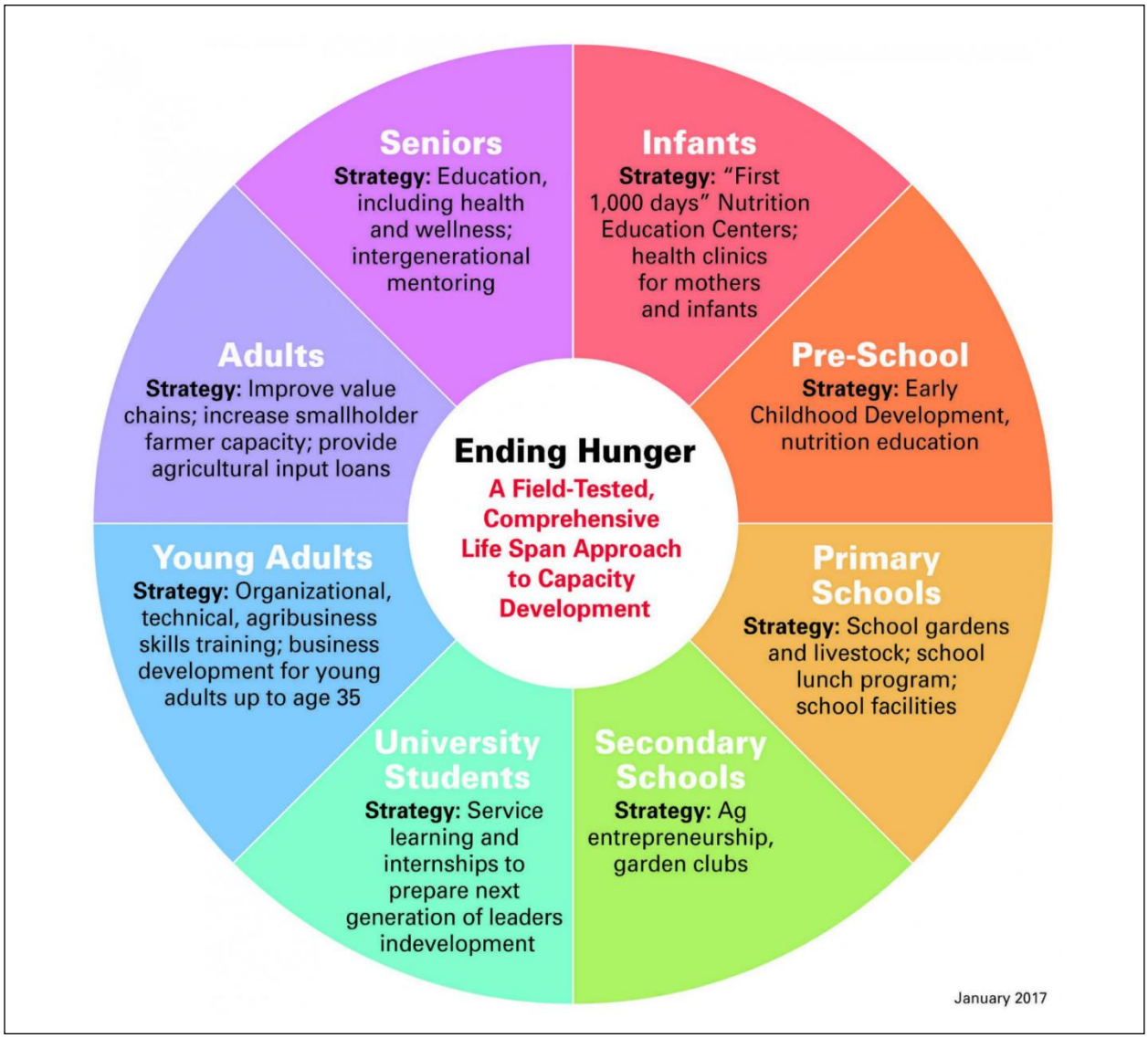
Iowa State University, through its mission to "create, share, and apply knowledge to make Iowa and the world a better place" (ISU, 2016, p. 2), joined the call to reduce hunger by deploying a concept of social change that involves identifying and building on community capital with funds from private benefactors (Butler & McMillan, 2015; Ikendi & Retallick, 2023a, 2023b). To fulfill its overseas mission, ISU in 2003 established the Center for Sustainable Rural Livelihoods (CSRL) in its College of Agriculture and Life Sciences, to help communities in low-income countries, with Uganda targeted because of its current high poverty levels and the availability of reliable partners (Bundy III, 2015; Butler & Mazur, 2015; Kolschowsky & Kolschowsky, 2015). CSRL established its base in Uganda in 2004 with a three-partner model with Makerere University and a local nongovernmental organization (NGO), Volunteer Efforts for Development Concerns (VEDCO). With VEDCO, CSRL operated with the "farmer-to-farmer" model forming food security groups in which extension and support were delivered by the program for capacity building (Butler & Mazur, 2015; Masinde, Butler et al., 2015; Sseguya et al., 2015). In 2014, ISU ended its collaboration with VEDCO and established its own NGO in Uganda, the Iowa State University–Uganda Program (ISU-UP) to improve on the operations with Makerere University remaining as a partner (Butler & Acker, 2015; Ikendi & Retallick, 2023b). The operational field model changed from the "farmer-to-farmer" approach to a "comprehensive lifespan approach to capacity development" (Figure 1) (CSRL, 2017; Ikendi, 2019, p. 50) and restatement of the vision and mission to suit the CSRL/ISU-UP partnership (Ikendi & Retallick, 2023b).

The comprehensive lifespan approach touches the lives of vulnerable people from pregnancy to seniors through different interrelated livelihood education programs.

The CSRL/ISU-UP Livelihood Education Programs

The CSRL/ISU-UP's LEPs aim to improve food and nutrition security at the household level by building household capacity to initiate behavioral changes. The programs include: **Agronomy and land use**, improving access to extension knowledge, quality, and diverse crop inputs; grain storage and postharvest technologies help reduce post-

Figure 1. The Center for Sustainable Rural Livelihoods/Iowa State University-Uganda Program (CSRL/ISU-UP) Comprehensive Lifespan Approach to Capacity Development in Uganda



harvest losses in schools and communities (Ikendi, Owusu, Masinde, Bain et al., 2023); **Livestock integration**, increasing household consumption of animal-source proteins, enhancing income, and improving breeding stock through training in sustainable livestock management (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Masinde, McMillan et al., 2015); **Food and nutrition security support groups**, improving food and nutrition security among at-risk-for-malnutrition rehabilitated and graduated nutrition education center (NEC) clients through the provision of technical support and the initiation of sustainable food production and income-generating activities (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b); **Community income-generation innovations program**, diversifying the incomes of graduated NEC clients and of in- and out-of-school youth through projects such as crafts, sewing, soap-making, home gardens, and livestock to build their livelihood assets (Ikendi, 2019; Martin, 2018); **Youth entrepreneurship program**, increasing the knowledge and skills of youth in managing small- to medium-size enterprises to

expand their livelihood strategies; **Education programs**, building the capacity of young program participants through global service-learning, implemented through school gardens and related projects (Ikendi, 2022a; 2022b; Ikendi, Retallick et al., 2023; Nonnecke et al., 2015). All these programs directly affect food availability and access through production and distribution between and among households.

Other programs include the **Nutrition education program** (NEP) addressing nutrition challenges through a community-based approach to the management of malnutrition (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b, 2023c; Masinde, McMillan et al., 2015) and enhanced school lunch programs (Byaruhanga, 2016; Ikendi, Retallick, & Nonnecke, 2023; Nonnecke et al., 2015, 2016). The NEP uses NECs to improve the nutrition and health of children less than five years old and women of reproductive age, promoting behavioral changes in obstetrical, gynecological, and nutrition and infant-feeding practices (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b, 2023c; Ikendi, Owusu et al., 2023; Winham et al., 2016)—obstetrical functions relate to pregnancy, antenatal, and childbirth while and gynecological functions relate to reproductive health functions—all of which are important to the welfare of mother and children (World Health Organization, 2021; 2023); **Water supply and public health programs** (water, sanitation, and hygiene [WASH]), increasing access to an adequate supply of safe water and improving personal and community hygiene and sanitation practices (Ikendi, Owusu et al., 2023). The NEP and WASH programs directly influence the food utilization component by ensuring that members are healthy and have less exposure to diseases, which can negatively affect food absorption and thus contribute to nutrition insecurity (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023c).

The activities of CSRL/ISU-UP partnership seek to affect the overall food and nutrition security of households and communities, this partnership has implemented programs in the Kamuli district of Uganda since 2014 (Butler & Acker, 2015; Ikendi & Retallick, 2023a; 2023b). No specific assessment of program impact on food and nutrition security has been undertaken, which is necessary to determine program outcomes. Regular monitoring and evaluation have determined the outputs; however, the outcomes are yet to be established. This study seeks to fill that gap.

Literature Review and Conceptualization of Food and Nutrition Security

Achieving sustainable, food-secure households requires multifaced approaches at macro levels—global, regional, and national—and at the micro level—households (FAO et al., 2022), as well as continuous assessments of progress (United Nations Environment Programme [UNEP], 2012). Households are food secure when they have consistent access to foodstuffs that meet their nutritional demands for a physically, economically, and socially healthy life (Committee on World Food Security, 2012; FAO et al., 2013). However, food security alone does not guarantee sustainable households; households also need to be nutritionally secured—hence the term food and nutrition security (FNS). Achieving FNS requires all elements of food security coupled with conducive sanitary environments with good healthcare, reducing household predisposition to diseases (CFS, 2012; FAO et al., 2013). The FNS concept is composed of four core pillars: availability, access, utilization, and stability.

The Four Pillars of Food and Nutrition Security

From a consensus in United Nations organizations to call for multifaceted approaches to FNS, the four pillars—availability, access, utilization, and stability—reinforce each other to achieve sustainable FNS (CFS, 2012; FAO et al., 2013). The elements of food security focus on food availability and access, while those of nutrition security focus on food utilization within our bodies. Food stability ensures future consistent food supplies even during periods of shock.

Food availability is a proxy indicator of the physical presence of food that households can obtain through their production, aid, gifts, and/or exchange (World Food Programme, 2009). The food production capacity of the nation is influenced by physical resources like climate and soil,

prevailing political activities, and population growth pressures (Barrett et al., 2009; Headey, 2021). Women's access to and control of land resources critically influence food production, as most food production, globally, depends on the efforts of women (Asitik & Abu, 2020; Barak et al., 2023; Doss, 2014). In addition to production, trade also influences food availability (Burchi & De Muro, 2016). Accelerating and integrating agricultural research in the agroecosystem to produce fortified crops like Vitamin A–enriched potatoes, rice, and beans enriched with iron has a multiplier effect on food supplies (Pangaribowo et al., 2013; Ikendi, 2023; Kassam & Kassam, 2021; Snapp & Pound, 2017).

Food access is the ability of households to physically obtain food from available stock, including their production, relief foods, exchanges, and/or purchases (WFP, 2009). The physical availability of food stocks in a nation does not directly correlate to its accessibility; food insecurity can exist even when food is available (Webb, 2010). Low purchasing power is among the factors that limit food access, especially in the current neoliberal economy where food is considered a commodity for sale (Bradley et al., 2023a; Broad, 2016; Clendenning, 2016; Hoddinott, 2021), primarily involving high-price, animal-source foods (Rosegrant et al., 2013). In India, for instance, the discriminative nature of the caste system prohibits some social groups from accessing activities that generate income to help raise their purchasing power (Pankaj, 2019). Other factors influencing food access besides economic are ideological and institutional constraints, for instance, the Ethiopia Orthodox Church since the fourth century has discouraged followers from consuming animal-source foods (Sandler, 1972; Seleshe et al., 2014). Access to healthy foods and the capacity to earn a living wage by all community members are paramount indicators of developing food security and healthy communities (Emmerman & Ornelas, 2021; Martin, 2018).

Food utilization is the ability of the body to absorb the nutrients in food, influenced by the health status of the body, diet, and availability and cleanliness of WASH facilities, which reduce the likelihood of related illnesses (CFS, 2012; Hwalla et al., 2016). Although food availability and access do not guarantee food utilization, income weaves availability, access, and utilization together. High income and certain consumption behaviors, for instance, may not positively influence the quality of diets; preference for hypocaloric (low-caloric foods) and/or hypercaloric (high-caloric foods) diets can lead to underweight and overweight conditions, respectively (Pieters et al., 2013). High income can also be predisposing to unhealthy consumption of alcohol and/or fast foods (Banerjee & Duflo, 2007; Bradley et al., 2023b).

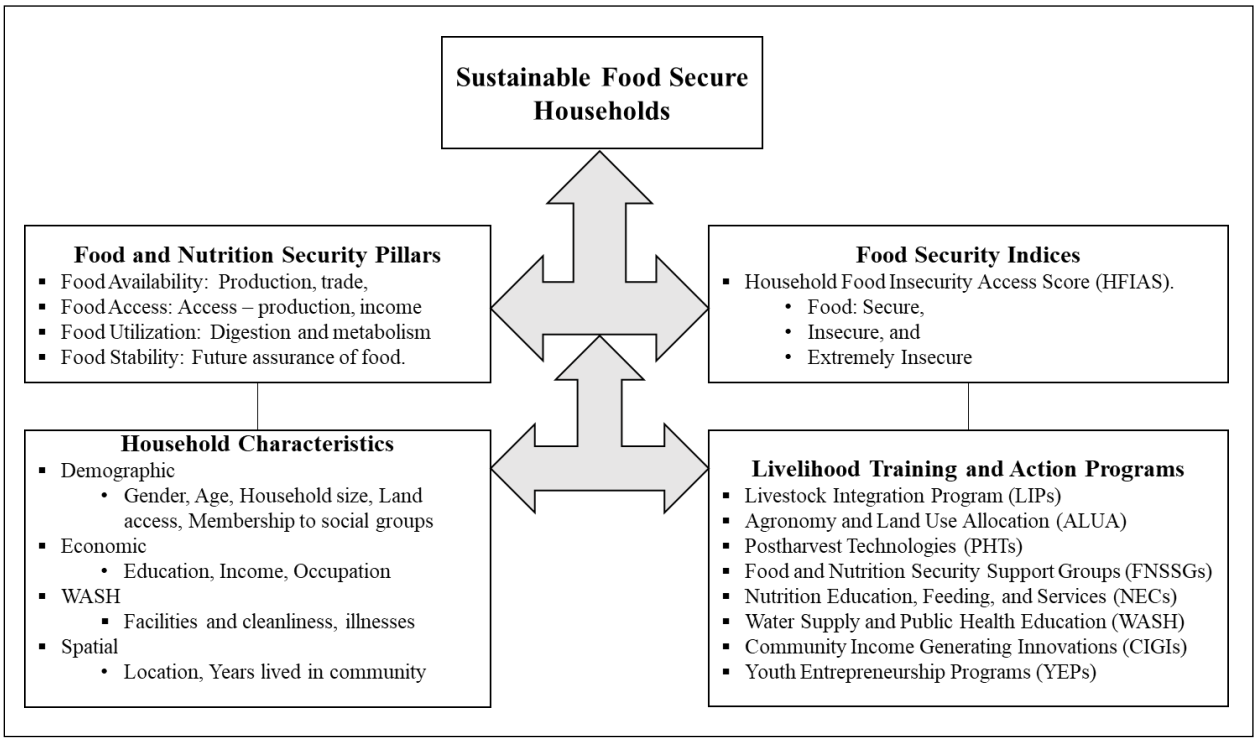
Food stability is sustainable access to food supplies, critically during periods of shock caused by extreme climate or weather events, including the "hunger periods" between planting and harvesting (WFP, 2009). The three parameters of production, prices, and storage are important in sustainable food access (von Braun & Torero, 2009). Investing in livelihood programs for rural development (Butler & McMillan, 2015), sustainable agroecosystem practices like conservation and biodiversity (Ikendi, 2023; Kassam & Kassam, 2021; Snapp & Pound, 2017; Thompson, 2017), price stabilization, and social protection programs help synergistically achieve food stability.

Food and Nutrition Security Status Measures

To determine the contribution of the four pillars of FNS, a method of analyzing their relationship as they contribute to a sustainable FNS state is necessary. Food availability is measured through the physical presence and abundance of food; food access is determined by household ability to physically obtain food; utilization focuses on the absorption of nutrients; and the state of sustainable access to food supplies assesses stability. The Household Food Insecurity Access Scale (HFIAS) developed by the U.S. Department of Agriculture (USDA) and the Food and Nutrition Technical Assistance (FANTA) project for developing countries are the most common measures of food access (Coates et al., 2007). They assess household food security status by determining the relative state of lack of food and its frequency over the 28 days before the survey is taken.

This study focuses on the food access pillar of FNS by employing a conceptual framework to

Figure 2. Food Security Conceptual Framework Designed for the Study



identify the pathways to FNS (Figure 2). The framework describes how the livelihood education programs of CSRL/ISU-UP are packaged to influence the four pillars of FNS individually and/or synergistically to achieve sustainable food-secure households.

Starting from where the farmers are (Masinde & McMillan, 2015), this framework illustrates how household characteristics influence their participation in LEPs to produce behavioral change, specifically how the multifaceted approaches adopted by the CSRL/ISU-UP achieve a secure FNS status in rural Uganda. It illustrates an intersection between the confounding variables—household characteristics influencing both participation in LEPs and directly influencing food security. To influence behavioral change in food production and consumption, it is prudent for interventions to understand the nature of the community in which they operate, as it facilitates buy-in of the innovative ideas (Rogers, 2003). Lanou et al. (2021) emphasize the importance of starting from where people are in promoting change in food consumption patterns.

Research Purpose and Objectives

The purpose of this study was to determine whether participation in the LEPs of the CSRL/ISU-UP affects the food security status of small-scale landholder households in Kamuli district, Eastern Uganda. Specifically, the study explored factors that influence household food security status and compared the food security status of LEP participants to that of nonparticipants. We set four objectives to achieve the purpose:

1. Describe the characteristics that influence household participation in CSRL/ISU-UP LEPs.
2. Determine the comparative household food security status among CSRL/ISU-UP LEPs participants and nonparticipants.
3. Determine the influence of CSRL/ISU-UP LEPs on household food security.
4. Explain the factors that influence household food security status.

Methodology

This comparative study was part of a larger survey study conducted among CSRL/ISU-UP LEP par-

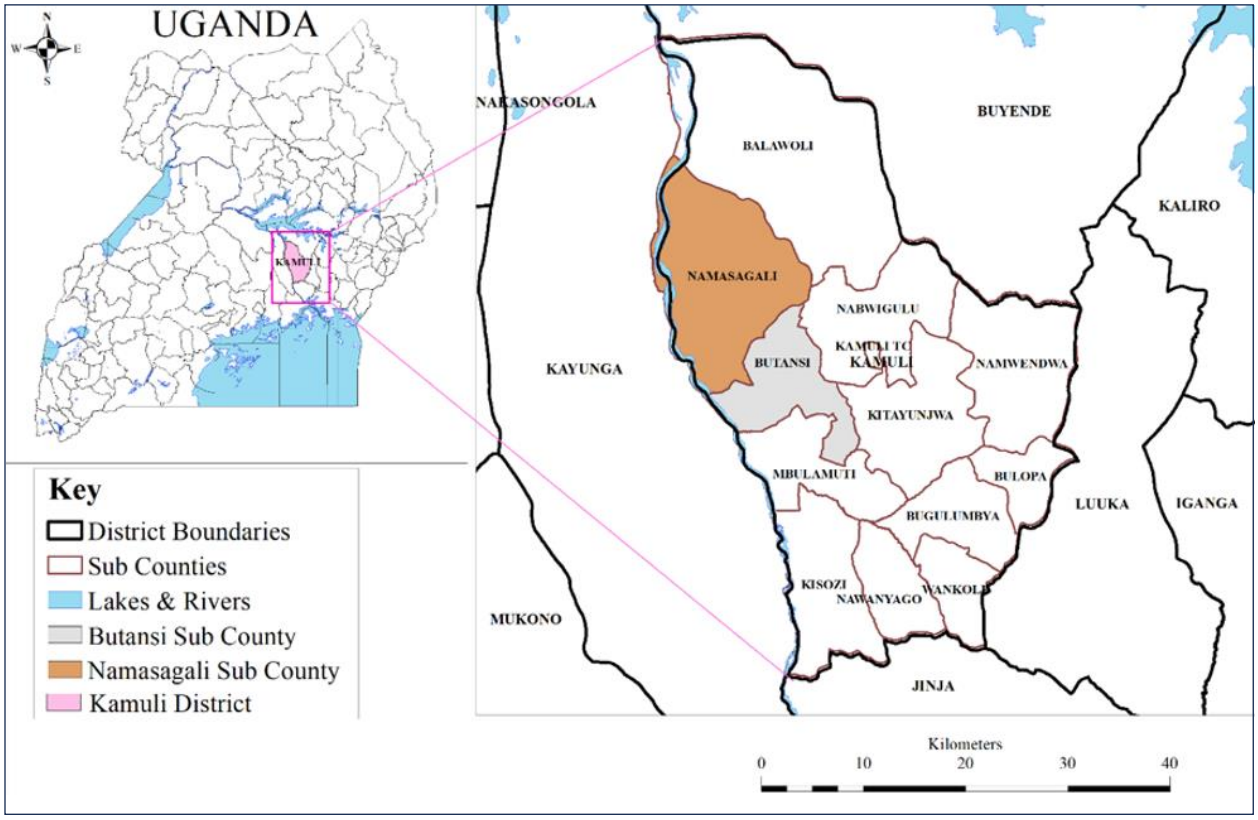
ticipants and nonparticipants (Ikendi, 2019). The goal was to determine the status of their food and nutrition security and to assess the state of implementation of relevant practices related to specific LEPs to signify changes toward desired behaviors in food and nutrition security. The study was part of a program impact evaluation of the 2014/2019 CSRL/ISU-UP strategic plan conducted concurrently with a comprehensive internal and external evaluation to determine the plan outcomes and set a foundation for the 2020–2024 strategic planning (Ikendi & Retallick, 2023b). The NEC participants and non-NEC community members who were or had engaged with the work of the CSRL/ISU-UP in the subcounties of Butansi and Namasagali in Kamuli district (Figure 3) represented program participants, while non-NEC clients represented nonparticipants.

The NECs are community-based centers where at-risk-for-malnutrition breastfeeding and pregnant mothers and children of 0–59 months of age are enrolled to be rehabilitated through nutrition therapy (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b). The CSRL/ ISU-UP is implementing sustainable rural LEPs in the Butansi and Namasagali subcounties of Kamuli district. The NECs are located in these subcounties where the study was conducted. A cross-sectional survey was employed to determine what impacts participation in LEPs had on participants' household food security (Table 2).

Sampling and Sample Size

Approval for the study was obtained from the Institutional Review Board at ISU (#IRB-18-356-01). Program participants were current and graduated NEC clients or had participated in any other CSRL/ISU-UP program, while nonparticipants did not participate in any CSRL/ISU-UP activities. The sampling frame for program participants was

Figure 3. Study Areas of Butansi and Namasagali Subcounties in Kamuli District, Uganda



Source: The authors generated the map using GIS ArcMap tools with administrative layers and shape files adopted from the Uganda Bureau of Statistics (2018).

the 1,503 households served by the NECs during 2014–2018. Using a 95% confidence interval with a 5% margin of error, we established a sample size of 306 potential participants randomly drawn based on proportions and spatial location of NECs; where areas that had more NECs, more clients were sampled. Participants were presented with the consent forms in Lusoga, the native language of the co-principal investigator and most research assistants. Only participants who provided verbal consent proceeded with the survey. All questions were asked in Lusoga, and responses were recorded on the paper survey in English. Appendix A provides a reflective essay exploring the positionality of the first author.

Community-based NEC trainers assisted the research team in identifying the NEC households. Of the 306 representative sample households, 253 (82.7%) were accessed and interviewed. For comparison, the study sought to sample one non-NEC household within a quarter-mile radius of an NEC household which had been interviewed. While we accessed and interviewed 201 non-NEC households, 63 had participated in other CSRL/ISU-UP LEPs; however, these were disaggregated and labeled "Program participants: Non-NEC clients." The remaining 138 households who had never participated in any of the CSRL/ISU-UP LEPs were categorized as "Nonparticipants." The study thus had a total of 316 households categorized as program participants, and 138 nonparticipant households, for a total of 454 households. Table 1 provides the spatial proportionate sampling of households by Subcounty and parish in the study area.

Data Collection and Analysis

Determination of food security

The response variable of interest under household food security was food access, employing the HFIAS (Coates et al., 2007). The HFIAS utilizes nine sets of questions that ask whether a food security–relevant situation occurred and the relative rate of frequency of occurrence (Table 2).

Determination of food security status was based on summing the frequency indices for 0 = None, 1 = Rarely, 2 = Sometimes, and 3 = Often, which generated a minimum of 0 and a maximum of 27 points for all nine questions. A three-equal cluster was generated with points: 0.0–9.0 as Food Secure, 9.1–18.0 as Food Insecure, and 18.1–27.0 as Extremely Food Insecure.

Participation in the LEPs and Household Factors that Influence the Food Security

The independent variables were identified as participation in the CSRL/ISU-UP LEPs and the

Table 1. Percentage of Spatial Distribution of Households in the Survey by Subcounties and Parishes

Subcounties	Parishes in the Subcounties	Number of NECs (*n*=12)	NEC Client (*n*=253)	Non-NEC Client (*n*=63)	Nonparticipant (*n*=138)	Overall (*n*=454)
Butansi	Naluwoli	16.7	26.9	34.9	19.6	25.8
	Bugeywa	25.0	21.7	15.9	16.7	19.4
	Butansi	16.7	13.0	12.7	9.4	11.9
	Naibowa	-	0.4	-	0.7	0.4
	Subtotal	58.3	62.0	63.5	46.4	57.5
Namasagali	Namasagali	-	1.2	4.8	13.0	5.3
	Kasozi	8.3	4.0	0.0	5.1	3.7
	Bwiiza	25.0	32.8	23.8	34.1	31.9
	Kisaikye	8.3	-	7.9	1.4	1.5
	Subtotal	41.7	38.0	36.5	53.6	42.4

Author note: There were 12 NECs by the time of the survey in 2018. Borders between subcounties and parishes are porous; clients can cross over. We did not interview NEC clients from Kisaikye parish because the NEC in that area was started a few months before our impact assessment.

Table 2. The Adapted Household Food Insecurity Access Scale Questions to Assess Food Access

No.	Question and Frequency of Occurrence
1.a.	In the past four weeks, did you worry that your household would not have enough food? 0 = No (skip to question 2), 1 = Yes (go to question 1. b.)
1.b.	How often did this happen? 1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
6.	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

Adapted from Coates et al. (2007, p. 4).

household characteristics which are the confounding factors believed to influence household food security: age of household head, education of household head, land ownership, livestock production, time spent to collect water, condition of WASH facilities, number of sick days for household heads by gender, number of meals consumed during the period of scarcity (typically the hunger periods between planting and harvesting), and membership in community social groups.

A multinomial logistic regression analysis tested whether participation in the LEPs and identified household characteristics influenced household food security status (FSS). The stated predictor variables were assessed against the response variable of household FSS, in terms of being Food Secure (FS), Food Insecure (FI), or Extremely Food Insecure (EFI). The LEP components of agronomy and postharvest technologies, livestock integration, nutrition and infant feeding, water supply and public health, complementary services, and community income-generation innovations, were merged as one variable that we labeled Participation in LEPs. Individually, the LEPs failed to meet the criteria for participation when they were tested for multicollinearity on indicators of Variance Inflation Factor (VIF) and/or Tolerance Value (TV). Leech et al. (2007) suggest merging such variables in cases where they are measuring a similar effect on the dependent variable, which in the case of this study was FSS measured in terms of food access using HFIAS.

Upon merging LEP components, a linear regression was then re-run to assess the multicollinearity for the merged LEP components and the household characteristics. The criteria for both VIF and TV were met (Appendix B). The final multinomial logistic regression model was run on household FSS as the dependent variable with three categories (FS = 1 as the reference category, FI = 2, and EFI = 3). The linear regression model results indicated an adjusted R^2 of 0.155, meaning that the model explained 15% of the independent variables. All factors in the model were greater than

the TV of 0.835, given as TV = 1 - R^2 (1 - 0.155 = 0.845) and exhibited a VIF greater than 1 but less than 2.5, as required (Leech et al., 2007). The model was run at a 5% significance level, with a less conservative 10% significance level also considered due to the high level of categorization of factors in the variables, which reduced their predictive power (Menard, 2000). All other household characteristics believed to potentially influence the level of food security were dropped to prevail over the multicollinearity problem.

Table 3. Percentage Description Characteristics of Households in the Study Area (*n*=454)

Characteristic	Indicators	Frequency	Percentage
Spatial Distribution			
Sub-Counties	Butansi	261	57.5
	Namasagali	193	42.5
Years Lived in Community	Less than 10 years	231	50.9
	Over 10 years	223	49.1
Social Demographic			
Marital Status	Single – Never Married	08	1.8
	Married – Monogamous	335	73.8
	Married – Polygamous	57	12.6
	Separated/Divorced	24	5.3
	Widowed	30	6.6
Gender	Male	373	82.2
	Female	81	17.8
Age	18–35 years	197	43.4
	36–59 years	207	45.6
	60+ years	50	11.0
Religion	Anglican	212	46.7
	Roman Catholic	91	20.0
	Islam	88	19.4
	Born Again	55	12.1
	Seventh-Day Adventists	05	1.1
	Noa	02	0.4
	African Tradition	01	0.2
Membership in Community Groups	Member	389	85.7
	Not a Member	65	14.3
Socio-Economic			
Education Level	Primary level	308	67.8
	Post-primary	146	32.2
Acreage of Land Owned	Less than 3.0 Acres	279	61.5
	Over 3.0 Acres	175	38.5
Water, Sanitation, and Hygiene			
Distance to Primary Water Sources	Less than two kilometers	433	95.8
	Greater than two kilometers	21	4.2
Time to Collect Water	Less than 30 minutes	283	62.3
	Greater than 30 minutes	171	37.7
Availability of WASH Facilities	Latrine	440	96.9
	Bathrooms	376	82.8
	Kitchens	394	86.7
	Rubbish pits	230	50.7
	Plate stands	157	34.6
	Tippy taps	206	45.4

Author note: Born Again resonates with the Ugandan understanding of Pentecostalism and the wholewide evangelical Christianity and emphasizes a spiritual rebirth to get saved from eternal fire especially members having ascribed to other religious affiliations in their previous life (Isiko, 2019).

Results and Discussion

This section presents results concurrently with discussion, aligned by the set objectives relating to household characteristics, livelihoods education programs and their influence on food security status, and the multinomial regression results on factors that influence household food security status.

Household Characteristics

Certain household characteristics were believed to influence both participation in LEPs and food security status. Table 3 describes the characteristics as assessed at the household level and/or at the level of household head. By spatial distribution, most households (57.5%) were from Butansi subcounty, where most NECs were located, and (43.7%) were from Namasagali. The majority were married in a monogamous setting (73.8%), and most households (82.2%) were male headed. Most household heads (45.6%) were between 36 and 59

years. Religion influences food consumption patterns; whereas the majority of participants were Anglicans and Catholics, religions such as Islam and the Seventh-Day Adventist Church prohibit consumption of certain animal-source foods like pork, adversely affecting their animal protein choices (Newell, 2023). Most households (85.7%) were members of community social groups, a crucial element in the development of social capital, which positively influences food security (Sseguya et al., 2018).

In water access, 95.8% accessed their primary water within two kilometers, and 62.3% fetched water in less than 30 minutes for a round trip to their primary water source. This is better than the national average of 45.0% taking less than 30 minutes for a round trip (UBOS & International Classification of Functioning, 2018). The availability of WASH facilities contributes to community safety and development. Proper maintenance of WASH facilities and good sanitary practices like washing hands are barriers to pathogen transmission, as feces contact primary sources and finally reaches food (Amadei, 2014; Ikendi, Owusu et al., 2023). Proper disposal and good sanitary practices reduce WASH-related diseases such as diarrhea and dysentery, and epilepsy, which is related to consuming tapeworm-infested pork due to open defecation (Nsadha, 2018).

In household size, there were a total of 2,728 members (1,320 males and 1,408 females) in 454

Figure 4. Total Number of Household Members by Age Group in the Study Area

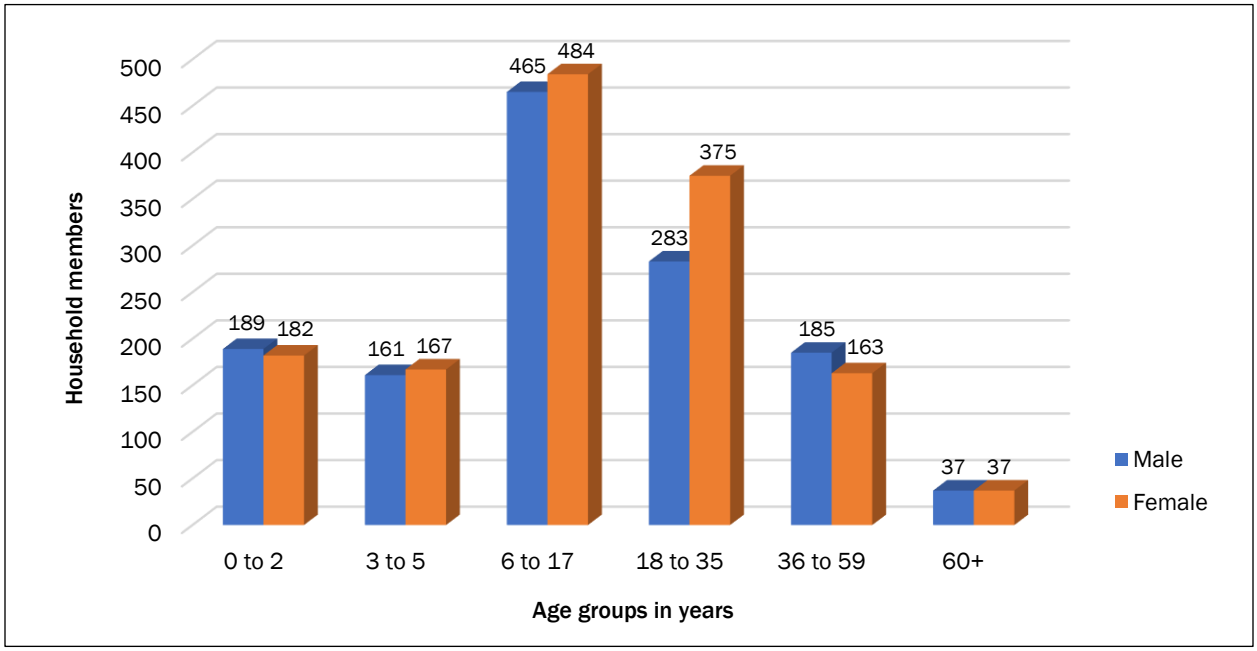


Table 4. Percentage and Mean Comparison of Household Food Security Status Between and Among Groups Studied

Household FSS as Measured by the HFIAS Index		NEC Households (*n*=253)	Non-NEC Households (*n*=63)	Nonparticipants (*n*=138)	Overall Households (*n*=454)	*p*-value
Food Security Status	Food secure	47.8	63.5	35.5	46.3	
	Food insecure	45.5	28.6	52.9	45.4	0.003
	Ext. food insecure	06.7	07.9	11.6	08.4	
ANOVA *post hoc* for HFIAS		9.54[b]±6.15	7.19[a]±7.33	10.94[b]±6.32	9.64±6.47	<0.001

[a & b] depict significant differences in mean scores between groups for the HFIAS.

households with an average of 6.0 members per household, above the national average of 5.0 persons per household (UBOS, 2017). This average suggests a growing population through higher childbirth and high dependence ratios, with a higher population of dependents between 0–17 years, as illustrated in Figure 4.

Household Food Security Status (FSS)

Households varied in their FSS both by affiliation with the NECs and participation in the LEPs (Table 4).

All 454 households were food insecure, with a mean of 9.64±6.47. However, there were substantial differences in mean scores among the groups. Analysis revealed that LEP participants who are Non-NEC clients were food secure, overall, with a mean of 7.19^{a}±7.33. However, participants who are NEC clients and Nonparticipants were not different from each other, despite the former having a lower mean of 9.54^{b}±6.15, below the overall mean, and the latter having a higher mean of 10.94^{b}±6.32, above the overall mean; both, overall, were food insecure.

When merged, the NEC clients and Non-NEC clients represent CSRL/ISU-UP household clients in this study. Cross-tabulation revealed that CSRL/ISU-UP participants were 51.0% more likely to be food secure compared to 35.5% of nonparticipants ($\chi^2 = 9.888$, $df = 2$, $p = 0.007$). These findings suggest a significant role for LEPs in improving food and nutrition security. These results are consistent with the findings of Seguya et al. (2018): households in their study participating in the CSRL/VEDCO program for 2004–2008 in Kamuli were 63.1% more food secure than nonparticipants. The CSRL 2004 baseline data revealed a 9.0% food-secure status; five years after the livelihood interventions, however, food-secure households rose to 53.7% overall (Sseguya et al., 2018), and increased further to 61.1% at the 2015 inception of the CSRL/ISU-UP partnership (Ikendi, 2019). Appendices C and D provide details of the food security statuses over 2004/2005, 2008/2009, 2015/2016, and 2018/2019 assessment periods.

In general, food-secure households increased in the study area after the inception of the CSRL in 2004 to 2015, and then declined by 2018. The improvement in food security 2004–2015 may be attributed to the "farmer-to-farmer" extension, which built group cohesion in food security through working with extension personnel to build capacity (Masinde, Butler et al., 2015; Sseguya et al., 2015). The program embraced indigenous knowledge to guide programming toward technology adoption (Ikendi & Retallick, 2023a; Masinde & McMillan, 2015). Emmerman and Ornelas (2021) contend that "changes stemming from community efforts are the most important to generating long-term improvements to food access" (p. 50) as well.

The CSRL/ISU-UP initiative relies on scientific findings to guide field operations in the assessment and adoption of innovative ideas (Acker et al., 2015; Ikendi & Retallick, 2023b). Findings and recommendations from several studies conducted in the programs and/or supported by the program directors inform action areas to improve FNS improvement strategies. Research areas have included livestock improvements (Ampaire, 2011; Kugonza et al., 2014; Marshall et al., 2023; Semahoro et al., 2018; Walugembe et al., 2014); postharvest technologies in grains and pest management (Bbosa et al., 2017; 2020; Brumm et al., 2021; Mayanja et al., 2018; Sserunjogi et al., 2021; Taku-Forchu, Lambert et al., 2023; Taku-Forchu, Qu et., 2023); food safety and food handling (Nabwiire et al., 2022; Nabwiire et al., 2023); global service-learning through school gardens (Ikendi, 2022a; 2022b; Snodgrass, 2012); school lunches (Byaruhanga, 2016; Nonnecke et al., 2016); value chains in tomato production (Taku-Forchu, 2019; Tusiime, 2019; Tusiime et al., 2019) and tropical pumpkins (Kwikiiriza, 2022); sweet potato production through climate-smart agriculture (Waaswa et al., 2021a; 2021b; Waaswa, Nkurumwa, Kibe, & Ng'eno, 2021); soil amendments (Akitwine, 2021; Anderson, 2023; Bwambale, 2015; 2019; Wokibula & Westgate, 2016); and promotion of amaranth production (Muyonga et al., 2010; Nampeera et al., 2019) – a major ingredient in therapeutic porridge at the NECs (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b) and school lunches (Byaruhanga, 2016; Ikendi, 2022b; Nonnecke et al., 2016).

However, after the CSRL/ISU-UP transitioned in 2014 to the "comprehensive approach to the capacity development model" (CSRL, 2017; Ikendi, 2019, p. 50), a baseline conducted in 2015 revealed 61.1% food-secure households and then a drop to 46.3% by 2018. This drop was commensurate with national and global trends; FAO et al. (2020) report that "five years after the world committed to ending hunger … we are still off track to achieve this objective by 2030" (p. 1). We found incidents when households often went an entire day and night without food (Appendix D), a high risk of food insecurity in Uganda reflected in the GHI (von Grebmer et al., 2022). Earlier projections of the current path scenario showed that "Uganda does not reach a food-secure future by 2050" (Hedden et al., 2018, p. 2), demonstrating the need to bolster partnerships with NGOs in the fight against hunger (Ikendi & Retallick, 2023b; Office of the Prime Minister, 2020).

Impact of Livelihoods Education Programs on Food Security Status

In Table 5, agronomy and postharvest technologies and livestock integration had a more significant

Table 5. Relationship Between Participation in Livelihood Education Programs and FSS

	Nonparticipant		LEP Participant		
LEPs and Household Food Security Status	*f*	%	*f*	%	*p*-value (χ^2)
Agronomy and Postharvest Technology					
Food Secure	86	36.6	124	56.6	<0.001
Food Insecure	121	51.5	85	38.8	
Extremely Food Insecure	28	11.9	10	4.6	
Total	**235**	**100**	**219**	**100**	
Livestock Integration					
Food Secure	109	38.9	101	58.0	<0.001
Food Insecure	143	51.1	63	36.2	
Extremely Food Insecure	28	10.0	10	5.7	
Total	**280**	**100**	**174**	**100**	
Nutrition and Infant Feeding					
Food Secure	91	44.2	119	48.0	0.141
Food Insecure	92	44.7	114	46.0	
Extremely Food Insecure	23	11.2	15	6.0	
Total	**206**	**100**	**248**	**100**	
Water and Public Health					
Food Secure	91	44.6	119	47.6	0.130
Food Insecure	90	44.1	116	46.4	
Extremely Food Insecure	23	11.3	15	6.0	
Total	**204**	**100**	**250**	**100**	
Complementary Services					
Food Secure	75	43.9	135	47.7	0.393
Food Insecure	78	45.6	128	45.2	
Extremely Food Insecure	18	10.5	20	7.1	
Total	**171**	**100**	**283**	**100**	
Community Income-Generating Innovations					
Food Secure	194	45.8	16	53.3	0.218
Food Insecure	192	45.3	14	46.7	
Extremely Food Insecure	38	9.0	-	-	
Total	**424**	**100**	**30**	**100**	

relationship with household food security among LEP participants than among nonparticipants.

Households involved in agronomy and post-harvest programs benefit from education related to land use planning, soils, composting, micronutrient gardening, postharvest handling, gross margin and marketing of produce, and from planting crops such as soybeans, amaranths, millet, iron beans, orange-fleshed sweet potatoes, tomatoes, spinach, eggplants, and collards (Ikendi, Owusu, Masinde, Bain et al., 2023). The findings of Muyonga et al. (2010) and Tusiime et al. (2019) on amaranth and tomato production, respectively, guided implementation of such projects to ensure increased production as well as enhanced income. Trained farmers also have access to silos, tarpaulins, and grain cleaners at subsidized prices from grain storage and postharvest projects (Ikendi, Owusu, Masinde, Bain et al., 2023). Research on pest management in stored grains (Bbosa et al., 2017; 2020; Brumm et al., 2021; Sserunjogi et al., 2021; Taku-Forchu, Lambert et al., 2023) and grain cleanliness (Mayanja et al., 2018) has been influential in programming interventions. The program bases its interventions on both scientific findings (Acker et al., 2015; Ikendi & Retallick, 2023b) and indigenous knowledge (Ikendi & Retallick, 2023a; Masinde & McMillan, 2015), which are significant determinants in the adoption and diffusion of innovations for community development (Chambers et al., 1989; Morrone, 2017; Pound & Conroy, 2017; Rogers, 2003).

For livestock integration, in addition to building participant capacity to manage enterprises involving local and exotic pigs, goats, cattle, and chickens, as well as forage and livestock marketing, access was developed to veterinary services including vaccinations and treatment through the Community Based Animal Health Workers [CBAHWs] (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Masinde, McMillan et al., 2015). Depending on the availability of funds, trained households are supported in starting and/or boosting their enterprises with resources such as building materials, layer chicks, Kuroiler chickens, ducks, breeding goats, pigs, forage seeds, feeds and ingredients, and water tanks to improve water access for livestock, crops, and household use. Based on the findings of Kugonza et al. (2014) to improve the breeding of local goats, the livestock program introduced Mubende (Bucks) goats for their breeding efficiency and superior profit margin. Other research that informed programming included Semahoro et al. (2018) on Kuroiler chickens, Marshall et al. (2023), Walugembe et al. (2014), Dione et al. (2014) on pig management, Maas et al. (2014) on forage production, indigenous chickens (Natukunda et al., 2011a; 2011b), and gender in livestock programs (Ampaire, 2011).

To improve nutrition security, nutrition and infant feeding programs are designed to promote behavioral change in obstetrical, gynecological, and feeding practices (Ikendi, Owusu et al., 2023; Masinde, McMillan et al., 2015; Winham et al., 2016). Participants learn about (exclusive) breast-feeding, complementary feeding, a balanced diet, and the clinical signs of malnutrition. Nutrition programs encourage mothers and youth to grow vegetables such as collards, onions, eggplants, tomatoes, spinach, and carrots in micronutrient gardens like sacks, keyholes, and kitchen gardens due to limited household land access (Duerfeldt et al., 2016; Ikendi, 2022b; Ikendi, Owusu, Masinde, Bain et al., 2023; Masinde & McMillan, 2015). The programs offer complementary services such as therapeutic porridge served to at-risk-for-malnutrition pregnant and breastfeeding mothers and children in malnutrition rehabilitation; the NECs use therapeutic nutrient-dense porridge locally made from grain amaranths, soybean, millet, and silver fish, and cooked with milk and (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b). The programs also work with government nurses to assist with immunizations and vaccinations, family planning, HIV counseling and testing, and training on domestic violence (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b; Ikendi, Owusu, Masinde, Bain, & Oberhauser, 2023; Masinde, McMillan et al., 2015; Winham et al., 2016).

Water supply and public health education promoted awareness of WASH, informing participants about personal and community hygiene, rat and jigger (a harmful sand flea) controls, and management of water resources (Ikendi, Owusu et al., 2023). Proper sanitation and health contribute to food uti-

lization (Burchi & De Muro, 2016). WASH projects ensure health as defined as the "ability to adapt and self-manage in the face of social, physical, and emotional challenges" to contribute to food production while "successfully adapting to an illness" (Huber et al., 2011, pp. 235–236). Proper sanitation reduces household vulnerability to WASH-related diseases like dysentery, diarrhea, and malaria (Ikendi, Owusu et al., 2023; Nsadha, 2018), while supporting household food production.

The community income generating innovations program supports the efforts of nutritionally rehabilitated mothers to work on crafts, primarily four products: bead products like bangles and purses, sewing machine products like backpacks and laptop bags, palm leaf products like mats, and raffia fiber products like baskets (Ikendi, 2019; Martin, 2018). The innovations program has expanded to include producing books for schools, soap, saving plans, small livestock projects, and engaging in- and out-of-school youth in home gardening programs. With the goal of sustainability, participants are trained toward self-maintenance of their projects, with the program offering technical support. In his change continuum, Rogers (2003) urges extension agents to provide discontinuance reinforcement through education and monitoring to make the community move on by themselves, a precursor to adoption of innovation for sustainable community development.

Factors Influencing Household Food Security Status

In the two models shown in Table 6, the resultant constants in a multinomial logistic regression—–1.150 in model one of food insecure (FI) and –4.325 in model two of extremely food insecure (EFI)—define their respective household FSS, which does not depend on the variables used in the models. All independent variables, except age

Table 6. Multinomial Logistic Regression Models for Factors That Influenced Food Security Status

FSS	Model Variables	B	SE	Sig.	Exp(B)
FI	Intercept	−1.150	0.269	.000	
	Participation in LEPs	0.413	0.233	.077*	1.511
	Age of household head	−0.281	0.237	.236	0.755
	Education level of household head	−0.077	0.226	.732	0.926
	Acreage of land owned	0.558	0.225	.013*	1.747
	Does the household keep any livestock	0.670	0.284	.018*	1.953
	Time in minutes spent to fetch water	0.350	0.221	.113	1.420
	General cleanliness of WASH facilities	0.785	0.216	.000*	2.193
	Days spent while sick for most adult males	0.527	0.332	.113	1.694
	Number of meals eaten during food scarcity	1.425	0.478	.003*	4.158
	Membership in community social groups	0.114	0.218	.600	1.121
EFI	Intercept	−4.325	0.619	.000	
	Participation in LEPs	0.485	0.404	.230	1.623
	Age of household head	−0.234	0.440	.594	0.791
	Education level of household head	0.323	0.460	.482	1.382
	Acreage of land owned	0.219	0.433	.614	1.244
	Does the household keep any livestock	1.014	0.449	.024	2.757
	Time in minutes spent to fetch water	0.993	0.396	.012*	2.700
	General cleanliness of WASH facilities	0.190	0.407	.640	1.209
	Days spent while sick for most adult males	1.942	0.456	.000*	6.972
	Number of meals eaten during food scarcity	2.467	0.608	.000*	11.787
	Membership in community social groups	1.365	0.437	.002*	3.914

* Significant factors.

and education of the household head, demonstrated a significant effect on the household FSS. These variables influenced the levels of FSS defined by Food Secure (FS) as the preferred category against FI and EFI individually and/or in combination.

Factors Influencing Households Being Food Secure Versus Being Food Insecure or Extremely Food Insecure

From the model, the factors of households keeping livestock and eating more meals during periods of food scarcity both influenced households being more FS than FI or EFI. Households keeping any form of livestock had a 95.3% likelihood of being more FS than FI and were 75.7% more likely to be FS than EFI. Livestock contributes to livelihood through products such as eggs, meat, and milk, and the sale of products and manure to meet family needs. Livestock, especially poultry, pigs, and small ruminants like goats and sheep, are pathways to food and nutrition security and poverty reduction in rural Uganda (Ampaire, 2011; Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023a; Kugonza et al., 2014; Masinde, McMillan et al., 2015; Marshall et al., 2023; Natukunda et al., 2011a; 2011b; Semahoro et al., 2018; Walugembe et al., 2014). As small animals are more easily managed by females, this favors involvement by women (Ampaire, 2011; Dione et al., 2014). Livestock is also insurance against crop failures, as their products can be sold off to buy food (Herrero et al., 2010).

The number of meals eaten during seasons of food scarcity was dichotomized into households eating at least two meals, and one or none, per day. Households having at least two meals had a 15.8% likelihood of being more FS than FI and were 78.7% more likely to be FS than EFI. Lack of food is a precursor to poor scores in dietary diversity and caloric consumption, alternative measures of food security (Swindale & Bilinsky, 2006). Poor food access increases the likelihood of birth of malnourished children due to poor fetal growth, with long-term effects such as poor cognitive development (Headey & Ruel, 2023; Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023c; Victora et al., 2021).

Factors Influencing Households Being More Food Secure Than Being Food Insecure

Overall, households that participated in the CSRL/ISU-UP LEPs had a 51.1% likelihood of food security rather than food insecurity. The factors that significantly influenced households being more FS than FI, but not significant for more FS than EFI, were general cleanliness of WASH facilities and acreage of land owned. Households with clean WASH facilities were 19.3% more likely to be FS than FI. As discussed earlier regarding the water supply and public health program, clean WASH facilities are less likely to predispose households to diseases like diarrhea and dysentery associated with households with dirty WASH facilities (Murray, 2020; Nsadha, 2018). Households having at least 3.0 acres (1.2 ha) were 74.7% more likely to be FS than FI, a finding consistent with a study by Malual and Mazur (2020) in Lira, Uganda, where households that cultivated at least 3.0 acres of land were determined to be more food secure. In Kamuli district, as available land has been shrinking over the years, the CSRL program has promoted land-sparing techniques of production such as sacks, keyholes, and kitchen gardens to increase vegetable production (Duerfeldt et al., 2016; Ikendi, 2022b; Ikendi, Owusu, Masinde, Bain et al., 2023; Masinde & McMillan, 2015).

Factors Influencing Households Being More Food Secure Than Extremely Food Insecure

The factors that influenced household being more FS than being EFI were number of sick days of most adult males, social group membership, and time spent for a round trip to fetch water from primary water sources. Households where most male adults had five days or less of illness were 97.2% more likely to be FS than EFI. Body productivity is lowered the more one stays bedridden. This is highly concerning in a population in which 82.2% of households are male- headed and men are traditionally considered household breadwinners. Therefore, the empowerment of women for access to household resources like land is an important means to improve livelihood (Matembe, 2002). Research indicates that women actually contribute the greatest amount of food production

globally (Asitik & Abu, 2020; Barak et al., 2023; Doss, 2014).

Membership in social groups, especially burial and festival groups, showed a 91.4% likelihood of households being more FS than EFI. Burial groups are community safety nets in times of grief, when members solicit foodstuffs for grieved families to help them manage the funeral. It is also a form of bidding farewell and creating social bonds with the dead (Shimane, 2018) rather than treating them as they are "just thrown away," as the Barlonyo in the Lira district of Uganda have been described (Proctor, 2013). Social groups are a sign of social capital development crucial in achieving FNS in communities (Malual & Mazur, 2020; Sseguya et al., 2018). In addition, in limited-resource communities, social groups serve as safety nets to access basic needs; for instance, rural women in Bangladesh have formed groups to help themselves during periods of food shock (Pieters et al., 2013).

Households that spent 30 minutes or less for a round trip to fetch water were 70.0% more likely to be FS than EFI. A combination of carrying by head and hand was the main method of carrying water (48.7%), followed by bicycles (37.2%). The average distance was 0.54 km (0.34 miles), with a maximum of 5.0 km (3.1 miles), to the primary water sources. A factor in these findings is that time saved fetching water can be used for other household or farm activities. Overall, 38.2% of households spent more than 30 minutes on a round trip, less than the established national average of 55.0% for rural dwellers (UBOS & ICF, 2018).

Summary and Conclusions

The goal of this study was to determine whether participation in the livelihoods education programs (LEPs) of the Center for Sustainable Rural Livelihoods/Iowa State University Uganda Program (CSRL/ISU-UP) improves household food security. We investigated three categories of household: program participants who were nutrition education center (NEC) clients, non-NEC clients, and nonparticipants. Food security status was assessed with the Household Food Insecurity Access Scale at three levels to identify food secure, food insecure, and extremely food insecure households (Coates et al., 2007). Overall, the food secure were 46.3% of the 454 households surveyed, 45.4% were food insecure, and 8.4% were extremely food insecure.

Disaggregation of households showed that 161 (51.0%) of the 316 CSRL/ISU-UP LEP participants were more likely to be food secure compared to the 49 (35.5%) food secure among the 138 nonparticipants. A larger proportion of extremely food insecure households (11.6% of 138) was found within the nonparticipants. We can therefore infer that the intervention of the CSRL/ISU-UP significantly contributed to improving the food security status of program participant households, most significantly among NEC households in or that had participated in the malnutrition rehabilitation program (Ikendi, Owusu, Masinde, Oberhauser, & Bain, 2023b).

In the multinomial logistic regression, overall participation in the LEPs significantly influenced households to be more food secure than food insecure. By program, participation in the agronomy and postharvest technologies and in livestock integration significantly influenced households' food security over insecure or extremely insecure. These programs directly contribute to food access through direct production and/or sale of output to purchase foods. They also increase home and farmgate (own production) and market (purchases) dietary diversity, helping to improve diet and caloric consumption, which are alternative measures of food security in terms of food access (Swindale & Bilinsky, 2006).

Participation in water supply and public health education, nutrition and infant feeding, complementary services, and community income-generating innovations also had a positive association with household food security. These programs, other than income innovation, substantially influence personal and household well-being and have strong multiplier effects in food utilization, a concept used in assessing nutrition security (World Health Organization, 1995; 2003). Income innovations by their nature contribute to food availability, access, stability, and sustainability of households; moreover, the program did not have any households that were extremely food insecure. These programs were mainly composed of households that had

gone through malnutrition rehabilitation and were engaging in efforts to increase their incomes to improve their livelihoods.

Of confounding household characteristic factors that influence both participation in the LEPs and household food security, we found that both keeping livestock and a larger number of meals eaten during seasons of food scarcity are more related to household food security than food insecurity and extreme food insecurity. Similarly, greater land ownership (at least 3.0 acres) and cleanliness of WASH facilities influenced households to be more food secure than food insecure. Lesser time required for a round trip to fetch water (less than 30 minutes), fewer days of illness for most male adults, and belonging to social groups influenced households to be more food secure than being extremely food insecure.

Recommendations at the Household Level

Since involvement with LEPs has a substantial multiplier effect on learning, households should be encouraged to engage more in LEPs to build capacity to manage activities that directly and indirectly influence food production. For example, participants in agronomy could learn how to use land-sparing techniques of production like sacks, kitchens, and keyhole gardens, and postharvest management practices such as using hematic silos to improve grain storage and quality. Techniques in sustainable livestock management, especially breeding programs in small livestock, can also help to improve local stock productivity and access to veterinary services, while complementary services like therapeutic porridge help manage malnutrition. Also, techniques in constructing and managing WASH facilities could help to enhance personal and community health. Income innovations enhance household sustainable livelihood strategies. All these engagements improve social capital through working in groups to improve food and nutrition security strategies.

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Appendices

Appendix A. Reflective Essay

This article on food security was extracted from the first author's (Samuel Ikendi) masters' thesis research conducted in Kamuli district, Uganda, where the Center for Sustainable Rural Livelihoods (CSRL) implements livelihood education programs (LEPs) to end hunger. Conducting this study involved trials and tribulations owing to my positionality. I am a native of Kamuli, and I was a graduate research assistant with the CSRL engaged in monitoring and evaluating the LEPs from 2017 to 2022. I do appreciate my fears of interviewing my community people which could result in providing predetermined responses for social desirability that could result in biased responses. For this reason, we recruited and trained a team of research assistants who were conversant with the native language and data-collection procedures and who possessed valid National Institutes of Health certificates. The community-based NEC trainers guided us to our target households in the respective communities.

The whole research process followed principles prescribed in the IRB approval and guidance from the program of study committee. The committee was composed of four advisors, who are co-authors of this article and are accomplished researchers, constantly engaged in international research and development. The second co-author, Francis Owusu, doubled as my major advisor and guided the writing to avoid bias in the article; he has no direct connection with the program. The third co-author, Dorothy Masinde, was familiar with the research area and has worked in Uganda since 2003 with the program. The fourth and fifth co-authors are accomplished social scientists and international researchers who have written extensively about East Africa. The idea of reflecting on my positionality shaped my conduct, as reflection was very influential in presenting the findings while controlling for my preconceived perceptions.

Appendix B.

Table B1. Linear Regression Testing for Multicollinearity of the Study Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.417[a]	0.174	0.155	0.584

ANOVA[a]

Model		S. Squares	df	Mean Square	F	Sig.
1	Regression	31.752	10	3.175	9.310	.000[b]
	Residual	151.085	443	.341		
	Total	182.837	453			

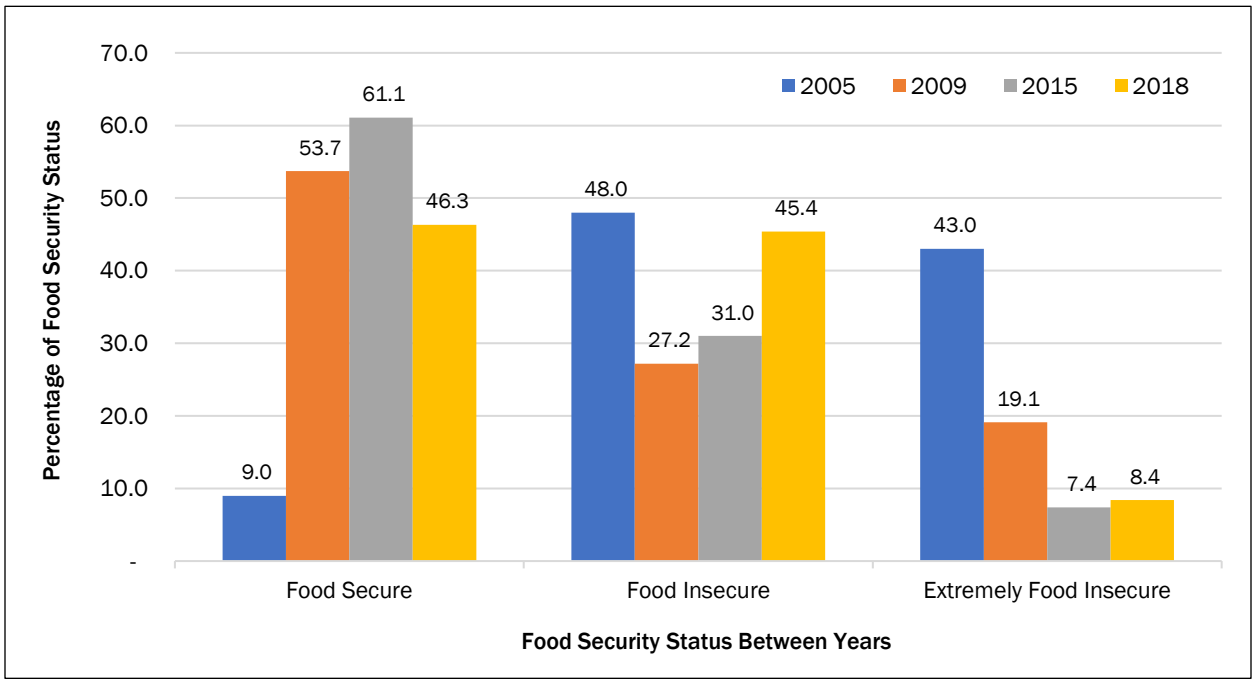
Coefficients[a]

	Unstd Coeff.		Std Coeff.	t	Sig.	95% C.I for B		Collinearity Statistics	
Model Variables	B	SE	Beta			LB	UB	TV	VIF
(Constant)	2.76	.14		20.448	.000	2.49	3.04		
Participation in LEPs	−0.11	0.06	−0.08	−1.751	0.081	−0.23	0.01	0.968	1.033
Age of household head	0.07	0.06	0.05	1.121	0.263	−0.05	0.19	0.943	1.061
Education of household head	−0.02	0.06	−0.01	−0.267	0.790	−0.13	0.10	0.971	1.03
Land ownership in acreage	−0.12	0.06	−0.09	−1.924	0.055	−0.23	0.02	0.898	1.114
Household keep livestock	−0.20	0.07	−0.13	−2.849	0.005	−0.34	−0.06	0.949	1.053
Time to collect water for round trip	−0.15	0.06	−0.11	−2.589	0.010	−0.26	−0.04	0.978	1.022
WASH facilities condition	−0.13	0.06	−0.10	−2.277	0.023	−0.24	−0.02	0.938	1.066
Days of illness of most adult male	−0.33	0.08	−0.18	−4.082	0.000	−0.49	−0.17	0.966	1.036
Number of meals eaten in scarcity	−0.41	0.30	−0.19	−4.338	0.000	−0.60	−0.23	0.954	1.048
Membership to burial/ festivals	−0.15	0.06	−0.12	−2.571	0.010	−0.26	−0.04	0.931	1.074

a. Dependent Variable: Food Security Status
Unstd Coeff.: Unstandardized Coefficients.

Appendix C.

Figure C1. Food Security Statuses in Center for Sustainable Rural Livelihoods Operational Areas in Kamuli, Uganda, Since 2004/2005–2018/2019



Sources: Sseguya et al. (2018) – 2004/2005 & 2008/2009 under CSRL/VEDCO; and Ikendi (2019) – 2015/2016 & 2018/2019 under CSRL/ISU-UP partnership.

Appendix D.

Table D1. Percentage Frequency of Occurrence of Food Insecurity Situation, Baseline in 2015 and Endline in 2018 in Center for Sustainable Rural Livelihoods Operational Areas, Kamuli, Uganda

Household Food Insecurity Access Scale for Developing Countries to Determine Food Access	Percentage Frequency of Occurrence							
	None		Rarely		Sometimes		Often	
	2015	2018	2015	2018	2015	2018	2015	2018
1. Did you worry that your household would not have enough food?	36.2	28.9	25.2	16.3	30.6	46.7	8.1	8.1
2. Were you or any household member not able to eat the kinds of foods you preferred?	27.6	17.6	27.2	24.7	34.6	45.6	10.6	12.1
3. Did you or any household member have to eat a limited variety of foods?	29.4	26.0	25.8	22.2	34.2	40.3	10.6	11.5
4. Did you or any household member have to eat some foods that you really did not want to eat?	27.6	18.5	25.8	22.9	37.8	49.3	8.8	9.3
5. Did you or any household member have to eat a smaller meal than you felt you needed?	43.4	33.9	21.3	17.2	29.7	39.2	7.6	9.7
6. Did you or any other household member have to eat fewer meals in a day?	42.7	37.4	22.5	16.1	27.2	38.3	7.6	8.1
7. Was there ever no food to eat of any kind in your household?	64.7	58.8	13.3	11.0	17.5	24.2	4.5	5.9
8. Did you or any household member go to sleep at night hungry because there was not enough food?	65.8	74.7	18.0	10.1	14.4	12.6	1.8	2.6
9. Did you or any household member go a whole day and night without eating anything because there was not enough food?	75.5	83.0	12.4	7.5	11.5	7.0	0.7	2.4

* The frequency of Occurrence codes: None = No occurrence; Rarely = Once or twice in the past four weeks; Sometimes = Three to 10 times in the past four weeks; and Often = More than 10 times in the past four weeks before the survey (Coates et al., 2007, p. 4).

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Northeastern bakers' views on organic and regeneratively certified flours

Karen Hiniker Simons *
Hudson Varick Resources, Ltd.

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Abstract
There is a continued interest in reviving small and midsize grain mills that allow for more differentiated flour offerings, including mills with environmental benefits. This study seeks to assess Northeastern bakers' and distributors' views on U.S. Department of Agriculture–certified organic flour and potential demand for flour with the Regenerative Organic certification by conducting a survey of bakers and distributors. Results provide evidence that, for multiple reasons, many bakers use both conventional and certified organic flours despite the fact that they cannot call the final product organic and, if budgets allowed, would increase organic flour purchases. Bakers and distributors believe customers do not understand the importance of the organic certification, that customers need to be educated on the Regenerative Organic Certified label, and that bakers would switch to flour with a Regenerative Organic certification if quality and price were comparable to organic.

Keywords
conventional flour, organic flour, local agriculture, regional grain, regenerative organic certification

Introduction
There is continued interest in reviving small and midsize grain mills that allow for more differentiated flour offerings as bread and bakery product manufacturing represents the largest slice of a diversifying food manufacturing sector. In 2015, bread and bakery manufacturing represented 36% of food establishments and 67% of start-ups due to relatively low barriers to start-ups (O'Hara et al., 2021; Low et al, 2021). Commonly, specific "values" are conveyed through labeling systems across the agri-food supply chain, including geography (local, origin-specified), production practices (animal welfare, organic), and health and safety (traceability, free-from dietary restrictions; Onozaka & Thilmany 2011). Increasingly, bread and bakery manufacturers are embracing values-based labeling,

* Karen Hiniker Simons, CFA, Principal, Hudson Varick Resources, Ltd.; 380 Hook Road; Katonah, New York 10536 USA; KSimons@HudsonVarick.com

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as evidenced by the 51% increase in certified organic flour sales from 2019 to 2020 (Organic Trade Association [OTA], 2022). Sales of organic flours and baked goods grew by 30% in the same period (McNeill, 2021). Total sales of bread and grains using the certified organic label in 2021 amounted to US$6.2 billion, or 10.8% of total certified organic sales (OTA, 2022).

To support trust in values-based labeling schemes, the farming community led a call for a U.S. Department of Agriculture (USDA) Organic label for organic products. The effort dates back to 1990, when a coalition of farmers united in response to the proliferation of industrial farming practices such as the application of pesticides and herbicides to crops and the utilization of antibiotics in livestock production. In 2002, federal legislation formally instituted the USDA Organic labeling standards. As of 2021, products bearing the USDA Organic label made up almost 6% of the total food market in the U.S., worth US$57.5 billion (OTA, 2022). The Regenerative Organic Certified label (ROC), a community-led, values-based label launched in 2020, aims to address perceived deficiencies within the existing USDA Organic framework. Given demand for USDA-certified organic products, farmers and processors are now considering the newer ROC label and the potential market opportunities. This study assesses the views of Northeastern bakers and distributors on USDA Certified Organic flour and the ROC certification.

Conducted in 2022, this research initiative was commissioned by Farmer Ground Flour (FGF), situated in Trumansburg, New York. FGF is a certified organic micro-mill committed to spearheading the development of a sustainable grain economy in its region. FGF buys grain from local organically certified growers who practice regenerative farming principles, mills the grain with pink granite millstones, and sells the organically certified flour through wholesale and retail channels, mainly in the Northeast. FGF is working with their growers to certify under the ROC program. At this time, products with the ROC certification are few but growing in number. Brands such as Patagonia, Happy Family Organics, Tablas Creek Vineyard, and Alexandre Family Farm (their dairy, specifically) sell products with the certification. Currently, there is one farm producing ROC grains, milling and selling flour, according to the Regenerative Organic Alliance product directory (Regenerative Organic Alliance, n.d.-a).

Certifications communicate to buyers that the production practices of the producer follow the production practices defined by the certification program. The USDA organic certification program integrates cultural, biological, and mechanical practices that promote ecological balance and conserve biodiversity. The certification provides consumers with assurance that producers are adhering to specific USDA Organic practices and are not utilizing genetically modified organisms, certain synthetic chemicals, sewage sludge, irradiation, or genetically engineered plants (USDA Agricultural Marketing Service [USDA AMS], 2011).

The USDA is responsible for developing and writing the organic certification standards and is guided by the National Organics Standards Board (NOSB). The NOSB is a federal advisory board formed in 1992 with 15 volunteer members from organic businesses and interest groups. Because of the diverse advisory board, the USDA definition of organic has been subject to debate and lobbying pressure. The rules have become broader over time and more controversial. For example, hydroponically produced foods can now be certified as organic (USDA AMS, 2016) despite the organic movement's original focus on soil health. The organic program resides in the USDA AMS (n.d.). The explicit objective of AMS is to create domestic and international marketing opportunities for farmers. AMS' objectives do not include health, fair labor, animal welfare, or environmental concerns, concerns that have become a major focus for some consumers. However, to address some of the animal welfare concerns, the USDA recently published a new rule for organic livestock production (USDA, 2023).

In 2017, a group of farmers, business leaders, and other stakeholders focused on regenerative agriculture formed the Regenerative Organic Alliance and worked to develop the ROC program to address issues and limitations with the USDA organic certification. The ROC program, launched in 2020, uses the USDA organic certification as a baseline certification and additionally prioritizes

soil health, biodiversity, and carbon sequestration. The ROC also has holistic standards not addressed in the USDA organic certification, such as ensuring the highest possible standards for treating animals and farm workers (Regenerative Organic Alliance, n.d.-b). This certification also gave a definition and a process to the term "regenerative agriculture," which, unlike "organic agriculture," did not have a comprehensively agreed upon and regulated definition. The definition of "regenerative" has been subject to considerable academic and public debate (Schreefel et al., 2020) due to the complexity of defining regenerative production processes and desired outcomes.

Prior to the ROC, producers who wanted to communicate beyond organic or regenerative production techniques often certified with multiple certifiers to legitimize their claim. With each certification (USDA Organic, Demeter, Animal Welfare Approved, Certified Humane, Fair Trade Certified, etc.), producers had to abide by separate certifying processes, keep separate records, and meet with separate certifiers, involving significant time and expense. With the ROC, a single certification process incorporates the principles of many existing certifications. The Regenerative Organic Alliance has many professionals on its board from the previously mentioned certifying entities, making them well suited to develop and administer the ROC.

Background and Literature Review

According to the Organic Trade Organization, the demand for certified organic flours is currently outstripping supply (McNeill, 2021). One research study found that demand for certified organic wheat and wheat products is driven by a variety of factors that include health and environmental concerns as well as a desire to support sustainable agriculture practices (Curtis et al., 2018). This study found that organic buyers consider the organic label very important in their flour purchasing decision because consumers view labels as providing assurances about the production process (Janssen & Hamm, 2012). This finding is not surprising given that studies have found that the presence of labeling affects consumer perception and buying behavior (Bauer et al., 2013; Meyerding & Merz, 2018).

Demand for certified organic wheat and wheat products is high despite the fact that the products are more expensive than conventional. Research on organic food purchasing has generally found that consumers who value organic production methods are willing to pay a premium for organic products, although the size of the premium varies depending on consumer knowledge and the specific product. A meta-analysis by Li and Kallas (2021) found that the average price for organic foods ranges from 28.2% to 48% more than conventional foods.

Organic food ingredients, as part of manufactured foods, may face a different level of demand than less-processed products, although there is evidence that local food manufacturing patterns seem to match those seen for regions with high levels of local and organic markets (Low et al, 2021). Curtis et al. (2018), in a study of U.S. northwestern consumers, found that some consumers who were very likely to purchase organic were willing to pay almost twice as much for organic bread as other consumers. While there is willingness among some consumers to pay a premium, most consumers find the price of organic food to be the primary barrier to purchasing it (Aschemann-Witzel & Zielke 2017). Similarly, the price of organic wheat flour has been found to be a barrier for bakers (Drugova & Curtis, 2022; Hills et al., 2013). However, bakers, like consumers, are also driven by more than price.

In a small study of 45 bakers in the western U.S., Drugova and Curtis (2022) found that bakers view organic flour as higher quality than conventional flour, although the study concludes that the viewpoint could not be explained by factors examined in the study. Other studies have reviewed the technical aspects of conventional versus organic flour to determine whether there were quality differences. Gallagher et al. (2005) looked at the chemical and baking characteristics of flour from four different organic mills in the U.K. versus an Irish conventional flour and found the flours were of comparable quality with small technical differences that did not affect sensory aspects. Similarly, comparing four organic flours from U.K. mills to a conventional Irish flour, Gonzales-Barron and Butler (2008) found that there were textural differences in organic and conventional bread crumbs. They did not assess which bread flour produced a

higher-quality bread. Toader et al. (2019) found organic wheat flour produced in Romania to be of higher quality than conventional based on a variety of technical factors. Annett et al. (2007) found no difference on 14 sensory attributes, though the organic bread was found to be more dense. Drugova and Curtis (2022) determined that bakers cared most about the final baked product, baking properties, and flour freshness when purchasing organic flour, while other studies (Hills et al., 2013; Torres et al., 2020) found that the most important factors in purchasing organic flour were quality and consistency.

This study adds to the research by delving into how bakers view organic flour and why bakers buy organic flours despite the barriers. The research is specific to the U.S. Northeast, but similar views of organic flour may be found among other bakers across the U.S.

Methodology

Two surveys were developed for phone interviews, one for bakers and an educational culinary institution, and one for distributors. The surveys included both open- and closed-ended questions. The 28 questions asked about basic business characteristics, market channels, flour purchasing habits, purchasing volumes, viewpoints on USDA certified organic flour, and knowledge of the ROC.

Surveys were administered to bakery owners or, in the case of larger bakers and distributors, to the head baker or senior management. Thirty-five bakers were targeted, with 28 ultimately participating. The participants were selected from an extensive database of bakers, distributors, and educational institutions located in the Northeast. The database was developed from organic professional association memberships and industry contacts and through online searches for bakeries and distributors whose websites stated they used certified organic flour. Bakeries considered for the survey were either 100% organic operations or, alternatively, used organic flour in their operations. Bakeries were then categorized by size, and bakeries were randomly selected for interviews from each size category. Targeted bakers were contacted through email and phone calls, with 80% of bakers agreeing to participate in the survey. Results were summarized and analyzed using both Survey Monkey and Microsoft Excel data analysis tools.

Results and Analysis

Representatives from 28 bakeries and three distribution companies and the head baker at an educational culinary institution participated in one-on-one telephone surveys over the first quarter of 2022. Nine of the bakeries surveyed were 100% organic, two bakeries used transitional flours, 16 bakeries used certified organic flour as an ingredient in their nonorganic products, and one bakery was testing organic flour for an organic product line. The geographic composition of the bakeries was as follows: one in Connecticut and one in Maine; two in Massachusetts, Rhode Island, and Vermont; three in New Hampshire and New Jersey, 10 in New York; and four in Pennsylvania. The bakeries varied in the number of employees, years in business, and revenue. Nine bakeries were classified as large with revenues over US$5 million, five were classified as medium-sized bakeries with revenues between US$1 and US$5 million, and 14 bakeries were classified as small with revenues below US$1 million. Of the nine bakeries that used only organic flour, six were small, two were medium, and one was large. All but one bakery sold bread as the primary product, and all but one offered other products, such as cakes, pastries, and cookies. Five bakeries were wholesale only, 11 sold retail and wholesale, and 12 were retail only, including the two in-house bakeries for grocers.

Bakers bought flour from wholesalers, directly from the flour mill, or from farmers (Table 1). Of the 28 bakers interviewed, 29% purchased only from a wholesale distributor, 36% only from a mill, and 25% from both, and 11% bought grain directly from the farmer and milled their own. Four bakeries bought grain from a mill and milled their own. Of the large bakeries, three bought directly from a mill or a farmer, two bought wholesale only, and four bought from a mill and wholesale. Two of the nine large bakeries milled their own flour. Two medium bakeries bought directly from a mill, and three bought directly from a mill and wholesalers. Two of the five medium bakeries milled their own flour. Small bakeries bought from distributors (six) or local mills (six) or direct from the farmer (two).

Three small bakeries milled their own flour. See Table 1 for a complete summary of bakery flour purchasing.

The survey asked bakers about the types of flour they purchased and purchasing volume.[1] All purchased white flour and whole-wheat flour. White bread flour with less than 13% protein was the highest volume of flour purchased by far, with 60% of the bakeries purchasing conventional white bread flour with less than 13% protein and 40% purchasing sustainable/organic.[2] Whole-wheat was the second-highest flour purchased by volume but significantly less than white bread flour, at roughly 30% of the volume. Of the whole-wheat flour purchases, 79% of the bakeries purchased sustainable/organic whole-wheat flour rather than conventional, a significant difference in conventional versus sustainable/organic purchasing when compared to white bread flour purchasing. Total high-extraction (whole-grain flour that contains a high level of bran and germ) flour volume was slightly less than whole-wheat volume, and 64% of the purchasing was for sustainable/organic high-extraction flour. Survey results for high-extraction flour volume may be misleading as one bakery accounted for almost all the sustainable/organic high-extraction volume and 51% of the total high-extraction volume.

The large bakeries in this study were least likely to purchase sustainable/organic flour. Only 17% of the white bread flour purchased by large bakeries was sustainable/organic, while 50% of the white bread flour purchased by small and midsized bakeries was sustainable/organic. Distributors felt that the significant difference in sustainable/organic flour purchasing by bakery size might in part be due to small and midsize bakeries' tendency to have a larger percentage of retail customers. Baker-

Table 1. Bakery Flour Purchasing

	Large (US$5+ Million)		Medium (US$1–5 Million)		Small (>US$1 Million)	All Bakeries		% All Bakeries
Bakeries by Size	9		5		14	28		100%
Flour by Production Method								
Organic Only	1	11%	2	40%	6	43%	9	32%
Organic and Conventional	3	33%	1	20%	6	43%	10	36%
Sustainable and Conventional	2	22%	1	20%	0	0%	3	11%
Sustainable Only	2	22%	0	0%	1	7%	3	11%
Conventional Only	1	11%	1	20%	1	7%	3	11%
Sales Channels								
Wholesale	2	22%	1	20%	2	14%	5	18%
Retail	2	22%	0	0%	10	71%	12	43%
Wholesale and Retail	5	56%	4	80%	2	14%	11	39%
Purchasing Channels								
Wholesale Distributor	2	22%	0	0%	6	43%	8	29%
Flour Mill	2	22%	2	40%	6	43%	10	36%
Distributor & Mill	4	44%	3	60%	0	0%	7	25%
Farmer	1	11%	0	0%	2	14%	3	11%
Mill Flour	2	22%	2	20%	3	36%	7	25%

[1] Some bakers shared exact volumes, while others gave ranges or did not answer the question, making total purchasing volume calculations unreliable. A conservative estimate of the total monthly volume for all flour types purchased by all the bakers that answered the question exceeded 1.7 million pounds.

[2] "Sustainable" is defined as flour bought from transitional suppliers or local farms that were not certified but used organic production practices known by the baker.

Table 2. Organic and Conventional Flour Purchase Patterns[a]

Flour Type	# Bakeries Purchasing Flour Type	% Purchasing Conventional	% Purchasing Sustainable/Organic[b]
White bread flour <13% protein	20	60%	40%
White bread flour >13% protein	9	67%	33%
Whole-wheat flour	28	21%	79%
Whole-wheat all purpose	6	17%	83%
Whole-wheat pastry	3	0%	100%
High-extraction (half-white, sifted bread flour)	14	36%	64%
All-purpose flour	8	50%	50%
White pastry flour	5	60%	40%

[a] Not all bakeries disclosed flour types.
[b] "Sustainable" is defined as flour bought from transitional suppliers or local farms that were not certified but had organic production practices known by the baker.

ies selling to retail customers could charge customers more for bread, thereby covering the higher cost of organic flour, as they could communicate directly to customers the value of certified organic flours. Table 2 reports the number of bakeries purchasing a specific type of flour and whether the flours were conventional or sustainable/organic.

When bakers using conventional flour were asked if they wanted to use more certified organic flour, 82% of the bakers responded that they wanted to use more. Many bakers stated they did not use certified organic because of the cost. At the time of the research, the cost of certified organic white bread flour was significantly more expensive than conventional. For example, conventional high-protein white bread flour cost US$20.55 for a 50 lb. (23 kg) bag, compared to US$38.13 for organic high-protein white bread flour.[3] Certified organic whole-wheat flour was also more expensive than conventional but less so. Conventional whole-wheat flour cost US$26.13 for a 50 lb. (23 kg) bag, while certified organic whole-wheat cost US$38.14 for a 50 lb. (23g) bag.[4] Certified organic white bread flour was 86% more than conventional white pricing, while certified organic whole-wheat was only 46% more than conventional pricing. See Figure 1 for an example of the price differential between a bushel (approximately 42 lbs., or 19 kg) of conventional versus organic whole-wheat.

The price differential partially explains why bakers purchased certified organic whole-wheat at a higher rate than white bread flour. Bakers stated they were blending certified organic whole-wheat flour with conventional flour, despite the fact that they could not call the bread organic and receive the price premium organic brings. The survey found that bakers were blending certified organic flour with conventional flour for the following reasons:

1. Bakers stated that whole-wheat flours add flavor to bread and felt the flavor and baking properties of certified organic whole-wheat flours, especially organic whole-wheat flours from local mills, were superior to conventional. These views align with findings by Drugova and Curtis (2022). Similarly, a consumer survey conducted by Annett et al. (2008) found that bread made from organic wheat flour was preferred by consumers in both blind and labeled taste tests.
2. Bakers explained that by blending the less expensive conventional white flour with the more expensive, preferred certified organic whole-wheat flour, they were able to main-

[3] Interview with distributor, March 1, 2022.
[4] Interview with distributor, March 1, 2022.

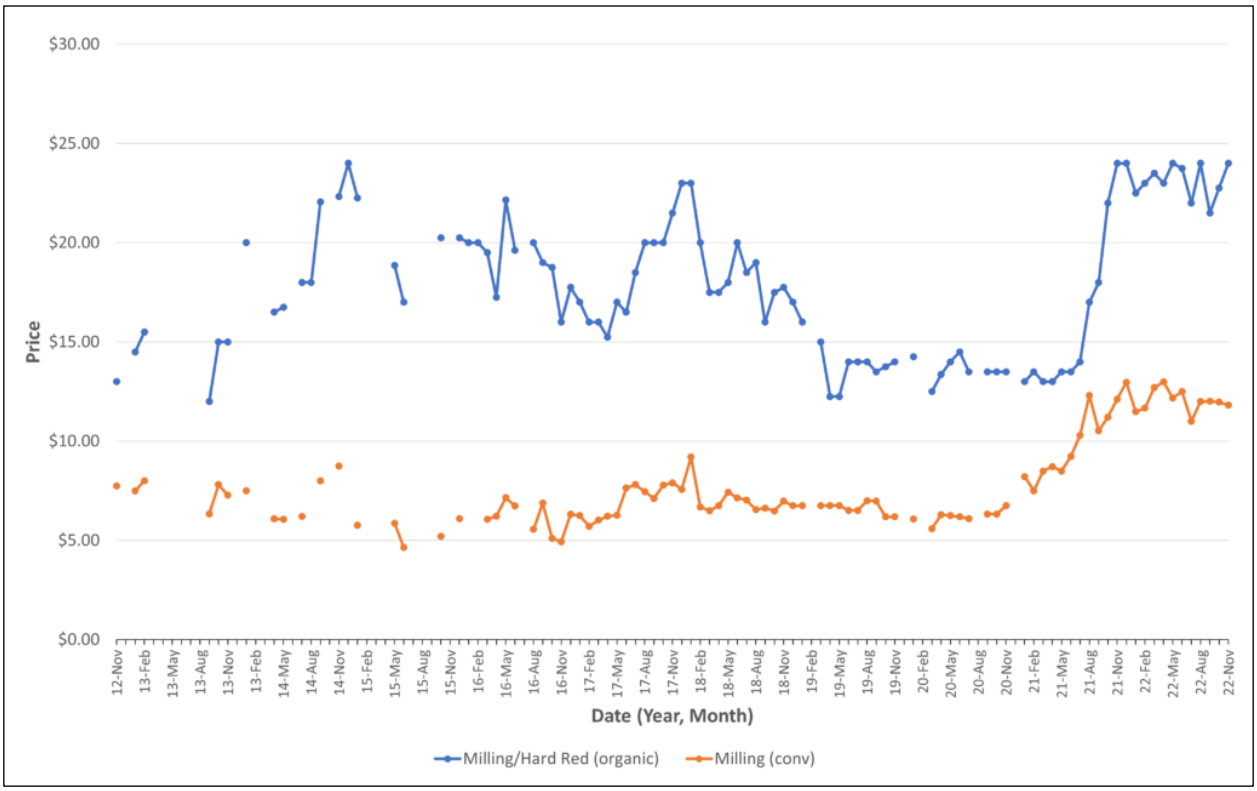
tain an acceptable price point for the bread while achieving the flavors and other attributes the bakers sought.

3. The price differential between conventional and organic was smaller for whole-wheat than for white flour.
4. Bakers felt it was easier to justify spending slightly more for the certified organic whole-wheat as whole-wheat constituted a small volume ingredient in the bread.
5. Bakers preferred certified organic because they felt it was better for people's health and the planet.
6. Bakers, especially at small bakeries, placed emphasis on their own value system when making purchasing decisions and believed their customers bought bread from them because of those values.

Three small bakeries purchased flour from farmers or mills that followed organic production practices but were not certified. These bakers felt customers trusted the bakery's values, and the bakers could communicate the story of the farm or mill's sustainable production practices to customers. Furthermore, the bakers felt sustainable flours were a good substitute for the more expensive certified organic option. Two large bakeries purchased sustainable flour from mills working with growers transitioning to certified organic. In these two cases, the bakeries communicated the value of sustainable production practices through advertising and touted their support in helping to transform the industry.

The cost of certified organic flours was the biggest barrier, but several other barriers also kept bakers from using more certified organic flour. Recent supply chain price increases created a significant barrier to increasing certified organic flour purchasing. Bakers reported the costs of all supplies had increased substantially and had forced many bakers to raise their bread prices. Many

Figure 1. Price per Bushel for Milling of Conventional versus Organic Wheat, November 2012–November 2022



Source: Pivot and Grow (n.d.).

stated it would be difficult to increase prices any further to cover the higher cost of certified organic flour.

Bakers stated that the market channel they sold into also dictated whether they purchased certified organic or conventional flours. Most bakers said customers were price-sensitive and demand was based on affordability. Bakers selling into wholesale channels felt wholesale buyers were much more price-sensitive than retail buyers and wholesale cared less about certified organic. Bakers serving retail markets were more likely to sell bread made with certified organic flour as they felt they could charge more for the loaf by explaining to the customer why the price of the bread was higher. Bakers also said customers wanted to feel good about spending more money and felt customers would buy the product if there was a farm-based story or certification to justify the higher price.

Distributors agreed the most significant barrier to bakers buying more certified organic flours was the price. However, distributors felt that given disrupted supply chains, multiple years of weather-related poor harvest, and the war in Ukraine, the price differential between conventional flours and organic was narrowing, and certified organic flours, especially locally produced organic flours, might become competitive with conventional. Distributors felt that certified organic flours were a growing category, with new bakers taking the lead in purchasing.

Lack of supply was the next stated barrier to bakers using more certified organic flours. Fifty percent of the bakers stated that certified organic flours were difficult to source. However, when asked which certified organic flours were difficult to source, the answers ranged widely, with bakers mentioning high-extraction, whole-wheat, specialty flours or, even, all flours. Supply issues may stem from the habit of bakers purchasing most of their flour needs from one supplier, and perhaps from minimum order sizes from distributors. If the bakery's supplier did not carry the flour type, some bakers felt that the product was in short supply. A few bakers, mostly the smaller operations, stated they did not have time to research new flour suppliers. If they found a new supplier, they were concerned the new supplier would be unaffordable due to shipping fees. Distributors believed there was a sufficient supply of all organic flours but that there were occasional shortages of specific brands.

Three bakeries and two distributors mentioned that certified organic flours had inconsistent attributes or quality issues. Quality primarily referred to the attributes of the flour across batches. At smaller mills, flour batches vary slightly in attributes as the mills are blending from fewer and smaller farms than the larger mills. Flour with varying attributes across batches requires skilled bakers or a production system that can easily implement recipe changes to accommodate the varying attributes. Distributors felt that few certified organic flour brands were as consistent as conventional commodity flours. Small and midsize bakeries identified King Arthur as having the most consistent certified organic flour, and many bakers purchased the brand's flour. Distributors perceived "old-school" bakers as less likely to buy certified organic as they may not have been trained to work with organic flours. One baker and all the distributors mentioned that bakers needed technical assistance from smaller flour mills due to the variations in flour attributes.

When asked what the most important market labels or certifications for bread were, 89% of bakers felt local was the most important label to their customers. Bakers believed the local label was important prior to the pandemic and became even more important during the pandemic as more consumers learned the importance of local businesses and local food supply chains. Seventy-nine percent of the bakeries used the local label to market their products. When asked the definition of "local," the answer varied widely, similar to findings in a wheat and flour study in western Washington state (Hills et al., 2013). Baker definitions appeared to be based on two main concepts: the baker's values and their perceptions of key drivers or labeling claims for customers. "Local" could mean that the bread came from the community or town, from within 40 to 250 miles, or from the state, New England, the Northeast, or the Eastern Seaboard. The term "regional" was substituted for "local" if local flour was unavailable within the bakers' definition of local. Interestingly, 75% of the bakers said they were willing to pay more for local flour, although

how much more was not indicated.

Bakers and distributors believed that most customers prioritized local, followed by sustainable and then organic when evaluating product labels. Bakers who had 100% certified-organic operations thought their customers valued baked goods made from certified organic flour. However, bakers were uncertain if the customers cared about the actual organic certification. In other words, these bakers thought that when some customers heard the word "organic," they did not fully understand the importance of the certification. Almost all the bakers and all the distributors believed that only some customers understood the significance of the organic certification or the meaning of certified organic. This belief aligns with research on consumer awareness of certified organic production standards (Drugova & Curtis, 2019; Meas et al., 2015). Nevertheless, extensive academic research has shown that consumers place trust in the certification and that the certification plays a crucial role in food choices (Annunziata & Vecchio, 2016; Bauer et al., 2013; Meyerding & Merz, 2018).

Notwithstanding the belief that consumers don't understand the role of the certification, bakers appeared to be committed to using certified organic flours because of flavor, health, personal values, and environmental concerns. Certification was seen as more important when the ultimate consumer bought bread through a third party. Bakers selling directly to consumers felt they were able to tell a story of sustainability and, therefore, the certification mattered less. See Table 3 for a summary of bakery opinions of customer views on certified organic flours.

Despite the stated barriers to using certified organic flour and the bakery marketing emphasis on local, 90% of the bakers believed that the retail and wholesale markets were moving toward sustainable or certified organic baked goods. While distributors viewed large bakeries and "old-school" bakers as less open to changing formulas or flour brands, they stated that the market was moving toward organically certified flours for health reasons and concerns for the planet.

Distributors felt the organic market was growing 10–15% a year and would grow faster if the price between conventional and organic flours narrowed. They noted that young bakers were setting the trends on bread and interest in protecting the planet and health reasons were increasing the demand. Distributors thought organic was more important to younger consumers but that all customers had learned to appreciate high-quality bread in the last two years. The largest distributor noted that bakeries were their strongest growth area, with many bakers looking to add an organic product line and some potentially looking to become certified organic bakeries. The same distributor stated that when restaurants figure out how to convey the certified-organic value proposition to their customers, demand for certified organic flour would increase.

In addition to buying more certified organic flour, bakers wanted to bake more bread with whole grains and whole-wheat flour but did not, as they felt customer demand was insufficient. Specifically, 79% of bakers were interested in offering more bread with higher whole-grain content. Bakers explained retail customers came in looking for whole-grain bread and then migrated to the white or whiter breads. As to why customers purchased white bread over whole-wheat, bakers provided anecdotal evidence such as customers like comfort food, other items look more appealing once the customer walks into the store, bread with a high percentage of whole grains is too heavy, the taste is not appealing, and white bread is cheaper. Several bakers believed that whole-grain products needed

Table 3. Bakery Perceptions of Customer Values on Certified Organic Flour by Grain Production Method

	Do customers care about organic certification?			Do customers value breads made from certified organic flour?		
	Yes	Maybe	No	Yes	Maybe	No
100% organic bakeries	4	4	1	7	1	1
Conventional bakeries	5	7	7	10	5	4
Total	**9**	**11**	**8**	**17**	**6**	**5**

to taste similar to white. Despite these impressions, bakers reported selling more whole-grain products through their retail channels than wholesale channels.

All bakers and distributors interviewed felt that as customers became more educated on the attributes of higher-quality bread, they would move toward whole-grain content in bread and felt that younger people appeared to be more open to eating higher whole-grain content. Distributors felt that some consumers had already shifted from white toward darker bread for health reasons and believed that it would take a decade for the rest of the market to move in that direction. One distributor noted that farmers markets were driving the demand for good bread made from whole grains.

The culinary institution felt strongly about bread being marketed as whole-wheat. In Europe, whole-wheat bread must use 90–100% whole grains, as the definition of what qualifies as whole-wheat bread is regulated. The U.S. has no such regulation. However, the Whole Grains Council has a whole-grain stamp for bread that contains at least 51% whole grain. The culinary institution in this research wanted whole-wheat definitions to be regulated in the U.S., similar to countries in Europe, so consumers would have a clearer understanding of what is actually in a whole-grain product.

When bakers were asked if they were familiar with the term "regenerative" and the ROC, 90% of the bakers were not. Once learning about ROC and its principles, 87% of the bakers said regeneratively produced flours would be of value to their customers, and 97% of the bakers were interested in purchasing regeneratively certified flours if the price was similar to certified organic. Bakers felt strongly that the public needed to be educated about the meaning of regenerative if they were to use ROC flour. Bakers felt many customers were already confused about the meaning of the terms "local," "sustainable," and "certified organic" and that adding yet another term without marketing support would increase confusion. Distributors were also unfamiliar with the ROC but said they would carry regeneratively produced flours if there was demand. They also stated customers would need to be educated on the term and the price point would have to be competitive.

Summary and Conclusion

This study assessed Northeastern bakers' and distributors' views on USDA Certified Organic flour and potential demand for Regenerative Organic Certified flour. The study established a bakery preference for certified organic whole-wheat flour over conventional whole-wheat, especially organic whole-wheat flour from local mills. The study also revealed that bakers would purchase more certified organic flour if budgets allowed, even though the local label resonated more with customers. Bakers wanted to use more certified organic despite believing that while customers valued the term "organic," the importance of the certification might not be fully appreciated or valued by customers. They felt only a minority of customers understood the meaning and importance of the USDA organic certification. The perceived lack of customer understanding and appreciation created hesitancy among bakers to purchase flour with a new certification. Bakers did not know the term "regenerative" or about the Regenerative Organic Certified label. However, once they learned that the ROC used the USDA Organic Certification as a basis and also focused on soil health, biodiversity, carbon sequestration, and worker and animal rights, bakers were very interested in purchasing ROC flour if the price point was competitive with certified organic.

According to the Organic Trade Association, the certified organic flour and bread market accounted for 10.8% of the total US$6.2 billion organic market in 2021, and a growing segment of consumer organic purchases (OTA, 2022). The availability of ROC flour may increase the overall market demand for certified organic flours or cause a shift to ROC flour once the term "regenerative" and the regenerative certification is better known and promoted. Consumers and bakers who already understand the principles behind the ROC or are closely aligned with the regenerative movement may be the early adopters of ROC flour. However, before demand increases substantially for goods produced with a Regenerative Organic Certification, bakers and the public will need to be educated. Without education, and the assumed increase in demand that education would drive, it will be difficult for millers to persuade farmers to

adopt regenerative practices or the Regenerative Organic certification.

The study also uncovered previously unreported bakery behavior in blending conventional and USDA certified organic flour even though the bakery could not label the final product as organic. Blending conventional white and organic whole-wheat flours allowed the bakery to achieve a perceived superior flavor and texture over using 100% conventional flours while maintaining an acceptable price point for the bread. Using organic flour also allowed bakers to bring their concerns for people's health and the planet into their practice. Although this study focused on northeastern bakers, the findings of blending and the viewpoints on organic whole-wheat flour, organic certification, and the ROC are unlikely to be unique to the region.

Research, Policy, and Practice Recommendations

This study was small and limited to the U.S. Northeast but provides insight into baker behavior and the use of organic flour and potential for ROC flour. Further research into understanding baker preferences and barriers to utilizing more certified organic flour would support growth in the organic and regenerative grain and flour industry. A literature review revealed baker organic flour preferences are understudied, as is household-level demand for organic versus conventional flour and other aspects of the organic and regenerative supply chain. Increasing the use of regenerative and soil health–focused organic grains and flours has the potential to address many environmental challenges facing agriculture, such as climate change, soil degradation, and loss of biodiversity. As such, further research, supportive policies, and practical implementation are needed to promote the industry. Research policy and practice recommendations arising from the research are as follows:

- Research factors driving the price difference between conventional, organic, and regeneratively produced grains and flour and the price premiums bakers and consumers are willing to pay for organic and ROC grains and flours.
- Research the quality and attributes of conventional versus organic versus regeneratively produced flours, including small or regional mills versus large mills.
- Undertake a larger study to understand baker and consumer preferences and barriers to using more certified organic flour and develop practices and policies that address these barriers.
- Develop robust national and regional sales data for USDA Certified Organic and ROC grains and flour.
- Research and develop effective communication strategies that educate on food labeling, the importance of USDA Organic certification, and the difference between the terms "local," "sustainable," "certified organic," "ROC," and so forth.

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Non-market distribution serves society in ways markets cannot: A tentative defense of food charity from small-town New England

Sam Bliss [a] *
University of Vermont

Alexandra Bramsen,[b] Raven Graziano,[c] Ava Hill,[d]
Saharay Perez Sahagun,[e] and Flora Krivak-Tetley [f]
Dartmouth College

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Abstract

It has become fashionable to call for ending food charity. Anti-hunger activists and scholars advocate instead for ensuring through government programs that everybody has enough money or vouchers to purchase all the food they need. Their criticisms rightly denounce charitable food for being incapable of eradicating hunger, but they neglect the advantages that charity confers as a non-market food practice—that is, an activity that produces or distributes food that is not for sale. Our interviews with non-market food practitioners in the Brattleboro, Vermont, area demonstrated that distributing food for free strengthens relationships,

[a] * *Corresponding author:* Sam Bliss, PhD Candidate, Gund Institute for Environment, University of Vermont; 210 Colchester Avenue; Burlington, VT 05405 USA; samcbliss@gmail.com

[b] Alexandra Bramsen, Undergraduate Student, Department of Environmental Studies, Dartmouth College; Hanover, NH USA; alexandra.l.bramsen.22@dartmouth.edu

[c] Raven Graziano, Undergraduate Student, Department of Environmental Studies, Dartmouth College; Hanover, NH USA.
Raven is now an Undergraduate Student at College of the Atlantic; 105 Eden Street; Bar Harbor, ME USA; rii.grazi@gmail.com

[d] Ava Hill, Undergraduate Student, Department of Environmental Studies, Dartmouth College; Hanover, NH USA; ava.b.hill.22@dartmouth.edu

[e] Saharay Perez Sahagun, Undergraduate Student, Department of Environmental Studies, Dartmouth College; Hanover, NH USA; saharay.perez.sahagun.23@dartmouth.edu

[f] Flora Krivak-Tetley, Lecturer and Postdoctoral Researcher, Department of Environmental Studies, Dartmouth College; Hinman Box 6182, 113 Steele Hall; Hanover, NH 03755 USA.
Flora is now a Postdoctoral Fellow at the Forest Measurements and Biometrics Lab at the University of British Columbia, Canada; flora.krivaktetley@ubc.ca

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fosters resilience, puts edible-but-not-sellable food to use, and aligns with an alternative, non-market vision of a desirable food future. Interviewees suggested that market food systems, in which food is distributed via selling it, cannot replicate these benefits. Yet food pantries and soup kitchens tend to imitate supermarkets and restaurants—their market counterparts—since purchasing food is considered the dignified way to feed oneself in a market economy. We suggest that charities might do well to emphasize the benefits specific to non-market food rather than suppressing those benefits by mimicking markets. But charities face limits to making their food distribution dignified, since they are essentially hierarchies that funnel gifts from well-off people to poor people. Food sharing among equals is an elusive ambition in this highly unequal world, yet it is only by moving in this direction that non-market food distribution can serve society without stigmatizing recipients.

Keywords
emergency food, non-market economies, food systems, decommodification, diverse economies, gifts, dignity, food bank, food pantry, soup kitchen

Introduction: The Critique of Charitable Food

The U.S. emergency food system of food pantries, soup kitchens, food banks, and food rescue projects arose in response to need in the early 1980s and grew, unplanned, as inequality intensified and the federal government cut social programs (Poppendieck, 1998). One in six U.S. residents received charitable food assistance in 2021, one-third more than before the COVID-19 pandemic (Feeding America, 2022b). While the proportion of individuals receiving food from charity held steady in 2022, anecdotal evidence suggests that rising prices sparked a spike in demand at food pantries and soup kitchens (Kelley & Kulish, 2022).

Critiques of food charity have grown right alongside the rise in food assistance (DeLind, 1994; Funicello, 1989; Riches, 1986). The foremost experts on charitable food often advocate for doing away with it (Butler, 2013; Fisher, 2017; Power, 2011; Riches, 2011). These researchers and activists hold that food charity will never end hunger and distracts attention from measures that could (Poppendieck, 1998; Tarasuk & Eakin, 2003). In her influential 1998 book *Sweet Charity?* Poppendieck observed that the expansion of charitable food allowed politicians to further dismantle the public safety net, as abundant charities feeding the poor give the appearance that hunger is being addressed. Critics argue that charities cannot solve hunger with food because hunger is a symptom of poverty; they call food charity a "Band-Aid" (Caraher & Furey, 2017; Lakhani, 2021; Tierney, 2014; Wilmot, 2014). Because so many people rely on food charity, however, even its harshest critics do not propose abolishing it immediately.

Some argue that food charity not only is palliative: it is corrupt as well. Anthropologist Maggie Dickinson (2020) notes that even as U.S. social spending has actually increased steadily since the mid-1980s, much of it now goes to voluntary, private organizations such as emergency food providers that, unlike public entitlements, do not offer poor people any enforceable rights. Anti-hunger leader Andrew Fisher (2017) contends that ever-expanding emergency food operations have become a "hunger industrial complex" that depends on the existence of food-insecure people (Azadian et al., 2022; Caraher & Furey, 2022). Fisher argues that food charities rarely take political stances on poverty-related issues such as the minimum wage because they receive money and food, as well as installing board members, from businesses that benefit from paying low wages to an impoverished underclass of workers that in turn relies on that same emergency food system (2017). Corporations thus appear generous even as they shift the costs of managing their food waste onto mostly unpaid laborers in the charitable food sector, who transport, sort, and prepare unsellable food and then feed it to the poor (Vansintjan, 2014).

Charitable food thus lacks dignity, according to its critics. It divides people by class—and often by race as well—into categories of giver and receiver (de Souza, 2019; Rosenthal, 2020). And it segregates the population into those who purchase proper food at stores and those who are given surplus food by charities (Poppendieck, 1998). A review of 20 studies on the experiences of people

in high-income countries who receive food from food banks found that they regularly report feeling shame and embarrassment as well as disappointment with the selection and quality of foods (Middleton et al., 2018). The screening process, sometimes called means-testing, humiliates impoverished people by making them prove that they are poor enough to merit food assistance.

At worst, charity functions to discipline the poor (Möller, 2021). Many religious food charities have traditionally forced beneficiaries to pray to the god of the benefactor or listen to a condescending sermon as a condition for being fed (Dachner & Tarasuk, 2002; Sager & Stephens, 2005). Poppendieck calls the proliferation of soup kitchens and food pantries a "retreat from rights to gifts" (1998, p. 12). Fisher writes that "individuals have an inherent dignity, which cannot be met through charity. Charity is a gift" (2017, p. 35). The critics of charity seem to imply that receiving food as a gift is itself demeaning.

We argue that it is inequality, not non-market food distribution as such, that is demeaning.[1] Outside the unequal relationships of charity, it appears that everyone appreciates receiving gifts of food. Free food is a typical tactic to spark attendance at any event, and there is some scientific evidence that it works (Segovis et al., 2007). People appear to enjoy the giving side of non-market food, too: in the U.S., "collecting, preparing, distributing, or serving food" is the most common volunteer activity (U.S. Bureau of Labor Statistics, 2016, para. 15) and food banks are now the leading cause to which people donate money (Barrett, 2022). Critics of charitable food blame the explosive expansion of the emergency food system partly on the fact that it feels so good, and so obviously right, to divert food from the garbage to hungry mouths (Poppendieck, 1998).

Critics of charitable food distribution generally argue that it should all but cease to exist. They advocate for addressing hunger by guaranteeing food as a human right rather than simply feeding people who lack access to food.[2] While some anti-hunger activists critique the commodification of food as such, many describe a desirable future in which everybody has enough money to buy all their food and does exactly that (Emery et al., 2013). They equate dignity with consumer choice and economic independence (Martin, 2021). If someone cannot access adequate food through markets, they argue that the state should be the feeder of last resort, preferably by means of vouchers for market food, such as the electronic benefits (often called food stamps) distributed by the Supplemental Nutrition Assistance Program (SNAP). Charity's critics seem to imagine a food utopia that leaves little room for autonomous, community-scale institutions that circulate meaningful amounts of food in ways other than selling it.

Several authors have, without negating these critiques, called attention to the transformative potential of food charities as spaces of care where marginalized people congregate to meet their needs and volunteers are often activists (Cloke et al., 2017; Vansintjan, 2014). Even authors of books criticizing charity tend to include a section on how food pantries and soup kitchens could form part of a dignified, effective emergency food system (Dickinson, 2020, pp. 153–154; Fisher, 2017, pp. 232–235; Poppendieck, 1998, pp. 316–318). On a practical level, charities provide much-needed nourishment to people who cannot avail themselves of government programs like food stamps because of their immigration status (Mares, 2013) or their failure to qualify for assistance (Dickinson, 2020). To these tentative, partial defenses of charitable food, we contribute a perspective that situates food charities within the broader realm of non-market food practices and institutions.

Non-market Food Practices and Institutions

To separate food-related practices into market and non-market categories is to simply ask: Is the food

[1] To be sure, the critical scientists and activists with whom we intend to converse here—Poppendieck, Dickinson, Fisher, Tarasuk, de Souza, Riches, Garthwaite, and others—would likely agree with this statement (Poppendieck, 1998, pp. 305–307). Several of them whom we contacted by email indicated as much.

[2] All the authors named in the previous footnote, except Tarasuk, are members of Global Solidarity Alliance, which has the slogan #RightsNotCharity. See https://rightsnotcharity.org/theory-of-change/

for sale or not? We focus on food practices and institutions *without* markets, because markets—the places and practices of buying and selling—direct food toward money rather than hunger and force farmers to prioritize financial viability over other goals (Bliss, 2019; White et al., 2022). Of course, many non-market practices involve some element of exchange (Mauss, 1925/1967), just as some market exchanges can be entangled in gift relations or encompass qualities associated with gifts (Herrmann, 1997). Food economies are diverse and difficult to split neatly into categories such as alternative and conventional (Sonnino & Marsden, 2006; Wilson, 2013). Rather than make subjective assessments of food's proximity to ideal types like commodity and gift (Benson & Carter, 2008) or capitalist and non-capitalist (Koretskaya & Feola, 2020), we divide practices into two categories based on whether or not food is traded for money, in part because it is a simple criterion to apply impartially. In so doing, we follow Clare Hinrichs' distinction between alternative markets and alternatives *to* markets (2000).

Non-market food practices are the production and distribution of food that is not for sale, and include (i) growing or harvesting food not intended for sale, such as gardening, hunting, foraging, and gleaning, and (ii) transfers in which food is not exchanged for money, as in gifts or charity. Non-market food *institutions*,[3] for our purposes, are just the groups and organizations that do these practices repeatedly, in patterned ways, such as a municipal community garden or a church-basement food pantry. We categorize practices and institutions, rather than the food itself, as market or non-market, since marketness is not a characteristic of individual food items; a carrot, for example, may be grown for market and then become a gift or donation at some point in its journey to being eaten. Even if markets and charity are symbiotic institutions, we can separate individual practices—sales and gifts, for instance.

This study deals primarily with non-market food transfers, which we also call non-market food distribution. Our findings concern not only what differentiates non-market from market distribution, but also dissimilarities among various forms of non-market distribution. We discuss how different practices interact with values such as dignity. Each of the common terms for describing non-market transfers, such as charity, barter, and sharing, encompasses a range of practices, and is thus too vague to be useful in evaluating different non-market arrangements. Instead, we make use of a typology that distinguishes between distribution practices based on the logics according to which the practices work. For this purpose, we adapt the four types of gift relationships that social theorist David Graeber (2009) draws from Karl Polanyi (1944) and Marcel Mauss (1925/1967). In *reciprocal exchange*, what is given and what is received tend toward equivalence in value over time, as when friends take turns buying each other dinner or neighbors give each other homemade items. The parties are equals, and can walk away from the relationship at any time if they are reasonably evened up.[4] In *communistic sharing*, people give according to their means and receive according to their needs. This might entail treating food as a joint possession, as is often the case within households, rather than as property to be transferred between individuals. What is given and received do not necessarily even out, but communistic sharing partners are in theory equivalently willing to give. In *hierarchical relations*, gifts are repeated, not reciprocated. These relations include mothers breastfeeding their children and states extorting "gifts" from their subjects' grain stores through tax collection. *Heroic gifts* are status-seeking games of one-upmanship: rivals compete for prestige by trying to bestow on each other gifts that cannot be reciprocated. The philanthropy that

[3] "Institutions" in this paper refer more closely to what are usually called "organizations," in that they are bounded groups with *internal* institutions such as shared norms or written rules (Hodgson, 2006; Vatn, 2007). We refrain from using "organization" as a catch-all for the groups represented to prevent confusion, since many—mostly, the non-profits—would self-identify as organizations, while others are businesses or networks, entities that do not tend to go by "organizations" in U.S. vernacular.

[4] One might consider market transactions a form of reciprocal exchange that is denominated in money and characterized by immediate reciprocation or calculated debt obligations.

funds food charities might fit in this category. Partitioning non-market food transfers into these categories helps us make sense of the possibilities for, and limits to, making charity dignified.

Charitable provisioning is far from the only non-market practice that feeds the hungry. In the U.S., people regularly give food to food-insecure neighbors through informal networks (Dickinson, 2020) and mutual aid groups (Lofton et al., 2022). Some evidence links food self-provisioning and sharing to improved nutrition and food security (Morton et al., 2008; Niles, Alpaugh et al., 2021a). In non-market societies such as remote fishing villages or hunter-gatherer bands, food sharing tends to work in ways that make sure everyone is fed, including by choosing recipients based on need (Nolin, 2010; Smith et al., 2019). Unlike charity, however, addressing hunger is not the goal but a byproduct of most of these other non-market food practices. People who share food informally tend to say they do so because it is joyful and sustains relationships in community (Jehlička & Daněk, 2017; Quandt et al., 2001). Non-market food practices meet more needs than just nutrition. Humans have been hunting collaboratively and sharing food for hundreds of thousands of years, after all. Evolutionary biologists argue that these non-market food practices coevolved with human cooperation, helping to make us the social beings that we are (Jaeggi & Gurven, 2013; Tomasello et al., 2012).

Although non-market foodways remain ubiquitous across countries and social classes, in high-income societies researchers are only beginning to study them as legitimate food systems and economic institutions in their own right (Bliss & Egler, 2020; Gibson-Graham, 2008; Jehlička & Daněk, 2017; Saito et al., 2018). In Vermont, the state that contains our study area, over half of households produce some of their own food (Niles, Wirkkala et al., 2021b), and about 40% received non-market food assistance in the first year of the COVID-19 pandemic (Burke et al., 2021). By positioning charitable food within non-market food, we fill a gap in both literatures.

Methods

To learn about non-market foodways, we interviewed a diverse group of actors in the networks through which non-market food flows in the Brattleboro, Vermont area. We adapted methods used by Owen et al. (2021), using semi-structured interviews with key informants to provide an in-depth assessment of local food systems.

Site

Situated along the Connecticut River, Brattleboro had 12,184 inhabitants as of the 2020 census. There were once over 170 farms in the immediate area; today there are about a dozen. C&S Grocers, a food wholesaler, operates a large shipping and warehouse facility that is Brattleboro's largest employer. Our study site also encompassed the neighboring, less populous Vermont towns of Dummerston, Guilford, Putney, Townsend, Vernon, Newfane, Marlboro, and West Brattleboro, as well as Hinsdale, New Hampshire. Food was almost certainly not bought or sold in this region before European colonization.[5] Market food has overtaken non-market food over the past four centuries as settlers seized and enclosed the land (Cronon, 1983; Larkin, 1989).

Data

Twenty-five semi-structured interviews ranging from twenty to ninety minutes were conducted over five days from November 8 to 12, 2021. We conducted interviews as a group; multiple researchers were present and asked questions at each interview. We asked interviewees about where their

[5] One of our interviewees, an Indigenous elder who serves as a liaison for the local Elnu Abenaki Tribe, said, "Traditional societies had no money." White men have long assumed that Native Americans used strings of white and purple beads made from mollusk shells, *wampum*, as a currency prior to European contact (e.g. Ingersoll 1883; Szabo 2002). It was actually colonists who, upon seeing that Native people valued wampum so highly, started trading it for the things they wanted and eventually made it legal tender in various jurisdictions (Herman, 1956; Slotkin & Schmitt, 1949). Before settlers began purchasing land and furs from Natives with wampum, Indigenous peoples had used it not for buying and selling but as a ceremonial gift, a personal ornament, and a physical reminder of political agreements (Bradley, 2011). In any case, there is no evidence of wampum's presence as far north and inland as Vermont before the arrival of Europeans.

food comes from and who receives it, what they care about in their non-market food practices, how these practices have affected their relationships, and what, if anything, is special about food that is not for sale. Our complete interview guide is in Appendix A. After obtaining verbal consent, we recorded audio at the interviews and used Otter.ai to transcribe recordings.

Participant observation informed our analysis as well (Walsh, 2009). We took part in several non-market food practices, including dumpster diving at a chain supermarket, preparing a food-pantry garden for winter, and food warehousing and preparation at a soup kitchen. All members of our research team have considerable experience in non-market food practices (our demographic information and participation in non-market food practices are in Tables D1–D3 in Appendix D).

We interviewed at least one worker or client at all five food charities in Brattleboro, and at one out of five elsewhere in the study area. We also interviewed representatives of six other institutions that give food away but do not self-identify as soup kitchens, food banks, food pantries, or food shelves (food shelf is the regional vernacular for food pantry). Following Poppendieck (1998), we interviewed more staff and volunteers than recipients, in pursuit of understanding the logics according to which these institutions work (Friedland & Alford, 1991). Of the 19 interviewees who filled out a survey with information about their demographics and participation in non-market food practices, 13 grew vegetables at home, eight grew them at community gardens, six kept chickens for eggs, and several hunted, fished, foraged, bartered, sugared maple, raised other livestock, and dumpster-dived for food (interviewee demographic details and non-market food practices are in Tables B1–B3 in Appendix B). Our small, convenience-based sample of food self-provisioners and informal sharers sufficed to place charitable food in the landscape of local non-market food practices (short profiles of each institution and practice we encountered are compiled in Appendix C).

Our sample is the main limitation of this study. We did not talk to people who were only minimally engaged in non-market food practices; they may see things differently. While we did not measure interviewee food security, it is likely that many have never experienced hunger, as we talked to more people on the giving side of charity than the receiving. One participant suspected that her lifelong privilege "probably is a huge factor in why free food is fun versus stigmatizing for me."

Analysis

The research team reflected, together and individually, on the interviews and experiences while walking and riding buses between field sites, over meals, and during downtime. We identified and discussed emerging themes. This allowed for continual processing and iterative analysis of the data, in the tradition of grounded theory (Glaser & Strauss, 1967). We chose whom to talk to and what to ask them partly based on what had emerged from previous interviews (Small, 2009).

From our notes and transcriptions, we created profiles of each non-market food institution and practice we encountered (Appendix C). We organized text from the transcripts into themes and reorganized these themes collaboratively. The themes ranged from patterns we perceived during the interviews to common threads that emerged when revisiting our notes and transcripts.

We also mapped the flows of non-market food between institutions using Gephi, freely available network analysis software.[6] Our network diagram shows food flows using directional categorized edges linking nodes, which represent institutions. The direction of food transfer—who sends food to whom—is shown using arrows. The diagram is a snapshot of this network in November 2021.

Results

The Brattleboro area non-market food network, like any food system, directs food from farms to consumers through various intermediaries. Figure 1 is a network diagram illustrating the flows of food between the institutions we interviewed (Table 1) and other institutions from which they receive or to which they send food (Table 2). The diagram's average path length (the mean number of transfers

[6] It is open source as well: https://gephi.org/users/publications/

it takes food to get from its origin to its end point, on all possible journeys it could take along the arrows in Figure 1) is 2.55. In most cases, this represents 1.55 institution-to-institution transfers within our study area and then a transfer to a household (the "Community" node in Figure 1).[7]

These paths tend to start at market food institutions. Supermarkets, restaurants, wholesalers, and

Table 1. Institutions Interviewed and Details on Food Acquisition and Distribution

In-degree is the number of other institutions from which the institution received food; out-degree is the number to which the institution transferred food.

Institution Interviewed		Food Acquisition			Food Distribution		
Name	Type	Origin of food	Mechanism	In-degree	Destination of food	Mechanism	Out-degree
Agape Christian Fellowship Foodshelf	church	purchased, donated	mixed	3	Everyone. "We don't say no to anyone."	non-market	1
Ames Brook Community Garden	nonprofit	grown	non-market	0	Community members with garden plots	non-market	1
Atowi Project	nonprofit	grown	non-market	0	Future goal: Abenaki tribal members	non-market	0
Edible Brattleboro	nonprofit	grown, donated	non-market	1	Everyone. "Even if you're a millionaire"	non-market	1
Everyone Eats	program	purchased from restaurants	market	18	Everyone "negatively affected by COVID"	non-market	24
Foodworks	nonprofit	purchased, donated, grown	mixed	10	Everyone. Record name but no ID or income verification	non-market	2
Loaves & Fishes	church	donated, purchased	mixed	7	Everyone. "Anybody who's hungry"	non-market	1
Nicole's Community Kitchen	catering	purchased	mixed	2	Everyone. "100% free, no questions asked."	non-market	1
Putney Food Shelf	nonprofit	purchased, donated, gleaned	mixed	6	Everyone.	non-market	2
Putney Mutual Aid	collective	purchased, donated	mixed	1	Everyone. Anybody can make a request	non-market	1
Retreat Farm – farmstand	nonprofit	grown, donated, purchased	mixed	4	Everyone.	mixed	1
– CSA	nonprofit	grown, purchased	mixed	1	Households on SNAP, WIC, or free/reduced school lunch	non-market	1
St. Brigids Kitchen and Pantry	church	donated, purchased	mixed	4	Everyone. "No criteria"	non-market	2
SUSU CommUNITY Farm	nonprofit	grown, gleaned, purchased, donated	mixed	5	35 BIPOC families in Windham County	non-market	1
Vermont Foodbank – warehouse	nonprofit	gleaned, donated, purchased	mixed	4	Organizations in the community	mixed	6
– Veggie Van Go	nonprofit	gleaned, donated, purchased	mixed	1	Anyone can pick up, including for other families	non-market	1
Vermont Wilderness School	nonprofit	gleaned, wild harvested	non-market	0	Students, staff and families	non-market	1

[7] Since our analysis includes only entities within the study site, on many paths the food "originates" not on farms but at grocers or other institutions that purchased it from elsewhere.

commercial farms either sell (green arrows) or give (red arrows) food to non-market institutions. Volunteers glean surplus produce from local fields. Grocers and bakeries donate what they cannot sell. Restaurants receive federal money for producing meals to be distributed for free through the Everyone Eats program. Vermont Foodbank warehouses local donations and cheap commodities to give and sell, respectively, to its partner organizations. Food pantries, church soup kitchens, and mutual aid groups receive food from all these sources and give it away to community members, in nearly every case without stipulations.

We identified 76 institutions through which non-market food flows in the greater Brattleboro area. Subtracting the 34 commercial enterprises that function mainly as donors, there is at least one non-market food institution per 780 inhabitants in our study area.[8] While the network diagram is not a comprehensive representation of the area's non-market food transfers,[9] it confirms the sheer magnitude of non-market food.

This snapshot of the local non-market food network looks different from what it would have been just 20 months before, in March 2020. Interviewees talked a great deal about changes in the

Table 2. Institutions Known to Give Non-Market Food to or Receive Non-Market Food from Interviewed Institutions

Restaurants	Grocery Suppliers	Community Organizations	Farms
Andrzej's Polish Kitchen	Aldi	Boys and Girls Club	Big Picture Farm
A Vermont Table	Brattleboro Co-op	Brattleboro Area Middle School	Circle Mtn. Farm
Bread from the Earth	C&S	Brattleboro Community Justice Center	Full Plate Farm
Delightfully Delicious Cafe	Hannaford	Brattleboro Drop-in Center	Harlow Farm
Dosa Kitchen	Price Chopper	Brattleboro Housing Partnership	Rebop Farm
Elliot Street Fish & Chips	Putney Co-op	Brattleboro Memorial Hospital	Rusty Plow Farm
Fast Eddie's	Shaw's	Brattleboro Union High School	Wild Carrot Farm
Hazel	UNFI	Bread of Life Food Pantry	Wingate Farm
India Masala House	Western Harvest	Dummerston Cares	
Jamaican Jewelz		Farmers Market	
Mama Sezz		Groundworks	
Newfane Market		Guilford Cares Food Pantry	
Pit Mistress		Guilford Central School	
Porch Too		Hinsdale Welfare Department	
Shin La		Leland & Gray High School	
The Works		Marlboro Cares	
Whetstone Station		Marlboro Elementary School	
Yalla		Our Place Drop-in Center	
		Project Feed the Thousands	
		Putney Central School	
		The Stone Church	
		The Works	
		Townshend Community Food Shelf	
		Turning Point	
		West River Valley Mutual Aid	
		Winston Prouty Center	

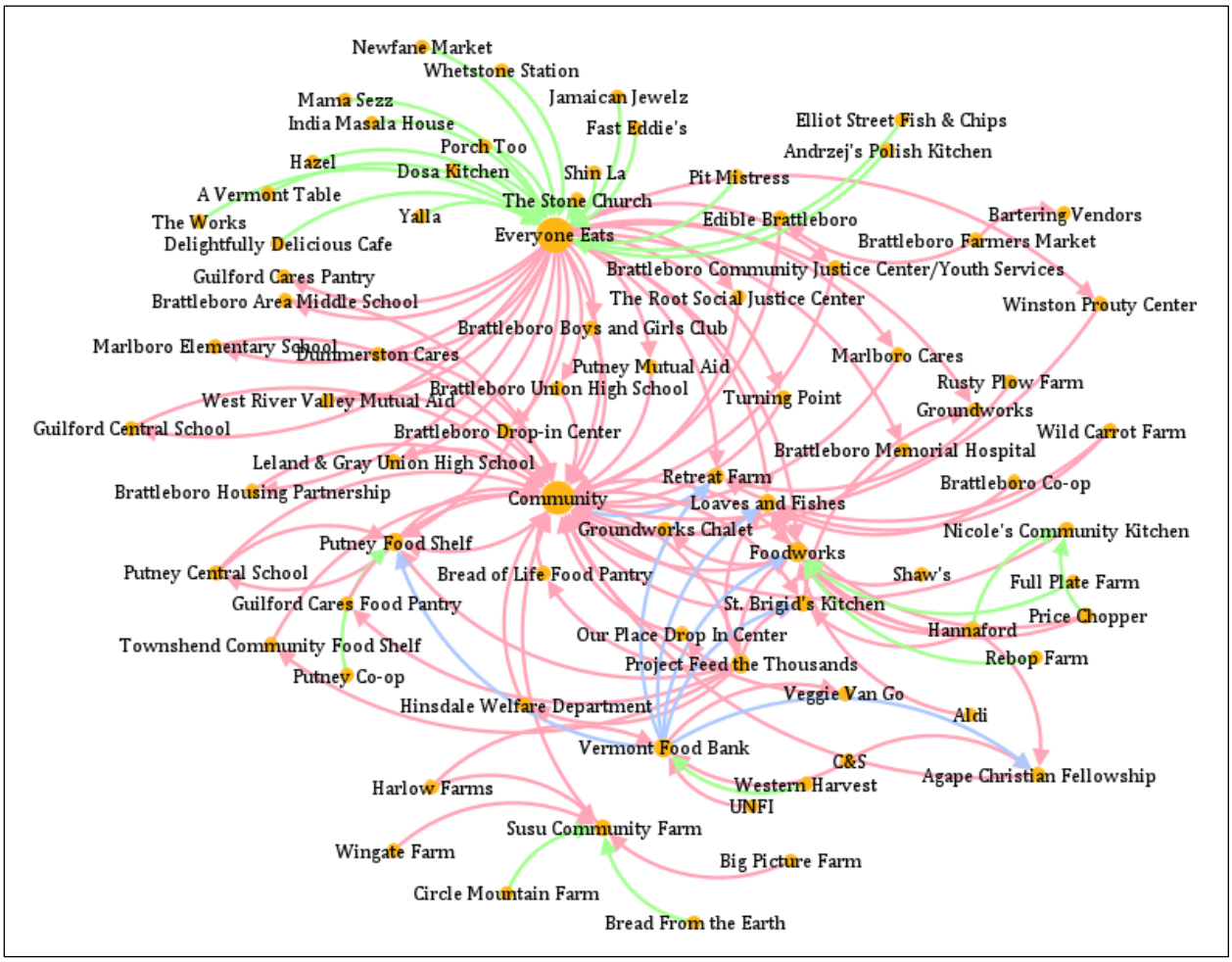
[8] As of the 2020 Census, the combined population of the Vermont municipalities Brattleboro, West Brattleboro, Dummerston, Guilford, Putney, Marlboro, Townsend, Vernon, and Newfane, plus Hinsdale, New Hampshire, was 32,821. Our network diagram includes institutions in all these communities. Divided by 42, this is one non-market food institution per 781 inhabitants.

[9] Since the diagram nodes represent institutions rather than individuals or households, it lacks any depiction of household-to-household food transfers, which are numerous. Moreover, the network diagram certainly misses some institution-to-institution food flows too, since some institutions appear as nodes not because we interviewed anyone involved with them, but because they were mentioned as non-market food sources or destinations by people we did interview.

charitable food landscape in response to the COVID-19 pandemic. Non-market food institutions multiplied considerably in number and size. There was more hunger, more volunteers, more funds, and, ultimately, more projects sharing more food. Charities reorganized to distribute greater volumes of food with minimal physical contact. Newly unemployed people both needed help and wanted to help. Neighborly goodwill and federal emergency-relief grants ignited new non-market food institutions, from mutual aid networks to the Everyone Eats program, which pays restaurants to make meals that are then distributed for free. The major food assistance organizations in the area started communicating with each other more, coordinating their efforts to avoid waste and ensure that food needs were covered. People from unincorporated operations and run-of-the-mill church pantries complained that all the additional resources went to businesses and large non-profits.

Figure 1. Non-Market Food Flows in the Brattleboro Area

Each node in the network represents a farm, business, organization, or other entity that produces, receives, and/or distributes non-market food. Each arrow, or edge, represents food moving from one entity to another, in the direction of the arrow. The color of each arrow indicates whether food flows through market exchange, non-market transfers, or both. Non-market food transfers, where food flows in one direction without money flowing back, are red. Market food flows, where institutions purchase food to distribute for free, are green. If an institution both buys and receives free food from another institution, the arrow is blue. The size of nodes corresponds to the number of connections. Individuals are represented as a single node in the network, labeled "community." Thus, institutions that distribute food to dozens or hundreds of households appear less connected than they actually are.



These changes are consistent with findings from Vermont-wide studies (Burke et al., 2021; Niles et al., 2020) and research elsewhere (Babbin et al., 2021; Carson, 2020; Ollove & Hamdi, 2021; Taylor et al., 2022).

We proceed to present the main themes from our interviews. First, we describe the attributes of non-market food practices that differentiate them from markets. Then we turn to the primary standard by which interviewees judged non-market food practices: dignity. We identify three approaches to making non-market food dignified: distributing high-quality food, emphasizing human equality, and imitating markets.

Non-market Food is Special

Interviewees described four main advantages of non-market food practices: that these practices strengthen relationships, enhance resilience, rescue food that would otherwise be wasted, and align with a vision of a desired future in which food is not for sale at all. These are benefits unique to situations where food is not for sale, positive attributes that markets cannot imitate. While describing non-market food as "special" seems unscientific, it is the most precise word we can use to indicate that non-market food practices and institutions do things that market food practices and institutions do not do.

Participants, for their part, called non-market food magical. A gleaning coordinator said that harvesting unmarketable crops with volunteer labor was a magical act. "I feel like Santa Claus every day," said a food shelf worker about giving food away. A mutual aid organizer said some see her "as a miracle worker." She insisted that she is not, but then inadvertently said, "It was like I parted the seas" when she would deliver donated meals to her town. Volunteers at one church food pantry said they were doing the work that "God chose us to do."

Several interviewees differentiated non-market food by articulating the deficiencies of market-based food systems. The most obvious difference is that commercial food systems do not feed people who cannot pay. One interviewee said, "Business is going to go where the money is, not to the poor." A participant of Mi'kmaq and European heritage pointed out that markets do not assign value to the nutritional, cultural, and ecological roles of food: "I see money as a proxy for power and control. It's no longer real. Food is real. Food cannot be thought of in terms of money. It's something we're in relationship to." Multiple participants described buying and selling food as transactional, in that it creates relationships designed to end immediately: after money has been traded for goods, the parties can go their separate ways.

Relationships

Participants said that non-market foodways, by contrast, create lasting and nurturing relationships. "Connection" came up often: connection to people, to where food comes from, to those who grow and prepare it, to ourselves, to the natural world. A forager said that receiving food as a gift, whether from other people or directly from the land, is an "invitation into an awareness of the chain of the web of relationships that brought this nourishment to me." He included relationships with non-human beings: "Starting to relate to a plant as something that you can eat, that can sustain you, that can help you survive, is an entry point into relationship with that specific plant and with that species."

Care was another common sub-theme within relationships. Non-market foodways consist of, to paraphrase our interviewees, caring for and about each other. A gleaning coordinator said, "The only reason we're there is because the farmer cares to donate the food instead of it going to waste. The volunteers care about helping to feed their community, so they're donating their time." Many appreciated that non-market food is given with care "even when it's done poorly."

The notion that relationships were more important than the food itself was a common refrain. Workers at non-market food institutions talked about the importance of kindness, generosity, and fostering togetherness. A woman who organizes a church soup kitchen said, "You can burn the meal, forget to show up if you're a volunteer, do the wrong thing. But those are not mistakes here. The mistake is if you mistreat somebody with a lack of dignity."

More than half the interviewees described sense of community as a special feature of non-

market foodways. At a soup kitchen, before the pandemic, "people were rubbing elbows and talking to each other and becoming a community, which is really what these things are all about," according to one volunteer.

Resilience

Seven interviewees commented on how these non-market foodways bring security to individuals and communities. In part, the relationships formed through food sharing protect community members through individual misfortunes or economic crises. "My concept of my own security in this community has increased just by knowing that there are people taking care of other people, even if it's not directly me," said one participant. "I live in this place where if I had a need, then I would also be taken care of, which is really, that's priceless." Fishers, foragers, hunters, and gardeners described their ability to harvest food from the local landscape as protection from the fragility of market supply chains.

Few participants mentioned "resilience" explicitly. However, a food bank employee said, "When you introduce diversity into a system, it becomes more resilient" to explain his organization's support for other non-market food institutions. A Black-stewarded farm delivered free weekly "Boxes of Resilience," full of their non-market produce and other local food products, to 35 BIPOC families in Windham County. A volunteer at a food pantry said that the commercial food system "isn't necessarily the one that will help folks survive" through economic and environmental crises.

Rescue

Non-market institutions keep edible food from rotting uneaten. A new employee at a food pantry said, "There's so much waste at these grocery stores … that would otherwise just get thrown away." He would know, having worked at a grocery store until several weeks before. He pointed out that even if the government were to provide enough food for everyone, there would still be enormous amounts of "still great" food produced originally for market but unable to be sold profitably.

The Brattleboro area's extensive network of non-market food providers rescues only a fraction of the excess of commerce. Our foray into the dumpsters behind two large grocers and a Dunkin' Donuts demonstrated that businesses generate more edible leftovers than they donate. Another pantry worker who had come to charitable food from the grocery industry expressed disbelief at the volume of supermarket surplus: "It's hard for me to wrap my head around, why so much production is happening. … If something is a certain item, and it's not selling, why would you continue to make it?"

"Food should be free"

Unprompted, six interviewees suggested that *all* food should be non-market. A White fisherman stated, "What we know about Native Americans is they didn't charge each other for food. I also don't think people should have to pay for food." A volunteer at a charity said, "It feels special to have free food but it should really just be normal. It's how it should be all the time in my opinion." Another participant stated, "An ideal world is one in which all food is non-market food and everyone has access to food they need through mutually beneficial relationships in their community." One person said simply, "Food should be free."

Producing and sharing non-market food enticed people to dream of worlds where food is not bought or sold at all. Their utopian vision contrasts with that of charity's critics, who describe ideal futures in which poverty is eradicated and everyone purchases virtually all their food.

Dignity

Interviewees who were involved in giving away food ascribed importance to doing so in a dignified way. In response to critiques of food charity, they spoke of striving for dignity. Strategies for making the provision of non-market food dignified encompassed three broad approaches, which we call the dignity of quality, the dignity of equality, and the dignity of commerce.

The dignity of quality

Dignity involves high-quality, healthy food. Interviewees often criticized the quality of food offered by *other* programs. One spoke of the "stigma grow-

ing up being a poor kid" in the 1980s, when food stamps were paper, Monopoly money-like coupons that could be traded for low-quality food. "Everyone deserves good food" captured a common sentiment. The dignity of quality was unanimously important to respondents and did not explicitly contradict either of the other conceptions of dignity.

The dignity of equality

The Brattleboro area's non-market food institutions also fight stigma by treating everyone as equals, and as equally worthy recipients. Only two of the 15 distribution projects in our sample imposed binding conditions regarding who could receive food (Table 1).[10] Edible Brattleboro wants to feed not just food-insecure people but everybody, "even if you're a millionaire." Some groups are trying to blur the line between givers and receivers, in the spirit of mutual aid. "I shop here all the time," said a volunteer at a church kitchen and pantry. Most institutions reported some overlap between contributors and recipients, but the constraints that put people in the position to need help often make it hard to give help.

The dignity of commerce

Another way institutions strive to give their non-market offerings dignity is by imitating markets. Charitable food workers often referred to recipients as "shoppers" or "customers," and explicitly rejected terms like "beneficiaries." "Choice is dignity," said several interviewees. They described how charitable food has evolved from a "canned green beans mentality" of "you should be happy with whatever food," to an environment where diverse dietary needs are met. During the pandemic, some food pantries preserved consumer choice as they shifted from indoor "shopping" to ordering systems. Black and Indigenous interviewees discussed choice as culturally relevant food and food sovereignty, meaning community control of food systems (Wittman et al., 2011). But for most participants, choice meant something closer to supermarket shelves or a restaurant menu—*consumer* choice.

Interviewees also associated dignity with anonymity, abundance, and aesthetics. Some commended programs such as 24-hour free farm stands and the federally funded Farmers-to-Families food boxes for providing non-market food in more anonymous settings than small-town pantries. Other interviewees mentioned wanting to make food feel abundant, telling participants to "take as much as you're going to use" or "as much as you need." There was also emphasis on sharing beautiful food in beautiful spaces. A worker was repainting a church's non-market farm stand during our visit, although the paint underneath was in good condition. Overall, many participants in our study considered food distribution dignified if it was marketlike.

Discussion

Our interviewees identified benefits of non-market foodways that researchers have found elsewhere. Across cultures, food sharing comes with relational intimacy (Koster & Leckie, 2014; Miller et al., 1998; Wang et al., 2021) and perceived resilience in the face of environmental and economic disruptions (Ančić et al., 2019; Berkes & Jolly, 2002; Ferguson et al., 2022). Indeed, charity in the U.S. goes by the name "emergency food" for its role in helping people withstand and recover from crises. By meeting nutritional needs with food that would otherwise be discarded, non-market practices obviate the need to produce more food with additional land, labor, water, fuel, and fertilizer (Penalver & Aldaya, 2022). The idea that all food should be non-market food has been put forward by numerous social theorists (Kropotkin, 1893/1913) and utopian fiction authors (Mumford, 1922/1962). Poppen-

[10] Both were CSA-style programs in which households signed up to receive weekly boxes of free food. One program required that participants qualified for some sort of government food assistance: SNAP (food stamps), WIC (food assistance for women, infants, and children), or free or reduced-price school lunches. The other program served exclusively Black people, Indigenous people, and other people of color. Other programs had symbolic requirements to qualify to receive assistance, such as the stipulation that one had to have been "negatively affected" by the COVID-19 pandemic, because these projects received government funds that obliged them to means-test beneficiaries.

dieck, who famously criticized food charity, argued elsewhere that school lunch should be free for all students, not just kids from low-income households (2011). This study's contribution is to express these already-recognized attributes together, as services that non-market food practices offer to society.

Interviewees also echoed critiques of charity from the literature, calling the charitable food system a "local solution" and a "Band-Aid" that "doesn't fix the larger problem." One pantry worker said, "I'm really glad that food shelves exist but of course I'd like to see them not exist." By contrast, another said they think food pantries "could be a hub for advocacy for anti-poverty work." In Brattleboro, as elsewhere (Wakefield et al., 2013), charitable food institutions have implemented many of the best practices to reduce stigma. For example, nearly every program lets recipients self-determine their need rather than making people prove they are poor to get food. However, according to Poppendieck (1998), these efforts reveal the limits to making charity dignified.

Perhaps charity cannot fully deliver what we are calling the dignity of equality because charity is founded on inequality. In the eighteenth century, moral philosopher William Paley wrote, "I use the term Charity … to signify the promoting of the happiness of our inferiors" (1785/2002 [Book III, Part II, chap. 1], p. 133). Charity has retained that meaning. Modern charitable food systems distribute gifts with the expectation that the action will be repeated rather than reciprocated; this is the distinguishing feature of hierarchical gift relations in Graeber's typology (2009). Economic inequality forces non-market food institutions to operate in this hierarchical fashion: some people have little to give and many unmet needs, while others have much to give and seem to need little; therefore, gifts tend to flow only in one direction, from haves to have-nots.

The Equality of Commerce

Yet, in a sense, the dignity of commerce *is* a dignity of equality (Sewell Jr., 2021). In markets, everyone pays the same prices and everyone's dollar is worth $1. Exchange is reciprocal. People who are in quite unequal economic states interact as equals. This is, to some, a source of markets' *un*fairness: many people cannot afford enough market food to meet their nutritional needs while others pay to overeat, waste food, and direct crops to livestock and biofuel production (Bliss, 2019). But, if equality begets dignity, then commerce is dignified at the level of the individual transaction even as it generates an extremely unequal world. That our interviewees set up non-market endeavors to resemble their market counterparts seems to contradict their assertion that non-market food distribution provides unique benefits, but perhaps charitable food institutions emulate commerce in part to feign interactions between equals.

Imitating commercial establishments is widespread in charitable food. Soup kitchens often intentionally look like buffets or cafés (Garthwaite et al., 2015). Food pantries are designed like grocery stores. In Europe, some "social supermarkets" distribute fake money—which some might call a single-purpose currency—to clients, who use it to purchase foods with made-up prices.[11] Conflicts arise as distinct moralities clash in this mishmash between a gift setting, where people are expected to act with gratitude and generosity, and a market setting, where the behavioral norm is to take as much and give as little as one can—to seek "deals" and sell to the highest bidder (Andriessen et al., 2022).

Other solutions to the problem of stigma involve actually selling food to the poor. Most "social supermarkets" work with regular money, selling donated food to people in poverty at reduced prices (Holweg et al., 2010). Fisher praises anti-hunger "innovations" like market farm stands and cash incentives for businesses to open grocery

[11] It is worth acknowledging here that all prices are "made-up" in the sense that price is not a physical property of products. Even in the theoretical market of perfect competition, humans still determine prices. We call these prices at the social supermarket "made-up" because "customers" pay for food with a special currency that is destroyed at the moment of purchase (that is, the social supermarket does not in turn use that special currency to pay workers or buy supplies) and so the prices are set to mimic prices at regular supermarkets, to simulate a normal shopping experience, rather than in relation to any revenue needs of the establishment.

stores in food deserts (2017). While these initiatives cannot make food accessible to people who literally have no money to purchase it, they do confer real participation in markets. In market society, purchasing food is the socially accepted, non-stigmatized way to obtain it (Byrne et al., 2023).

When charities imitate markets in the name of dignity, they affirm that buying food is the dignified method of feeding oneself. Celebrating anonymity reinforces the narrative that to receive free food is embarrassing. Glorifying "economic independence" entrenches the myth that paying someone for something does not mean depending on them (Fineman, 2000). Fetishizing consumer choice supports the notion that people exercise freedom by picking from the products that agroindustry offers (Patel, 2012).

Furthermore, when charities mimic markets, they diminish the unique benefits they can offer as institutions that distribute non-market food—relationships, resilience, food rescue, and alignment with a positive vision of a world where food is not bought and sold. If, as our interviewees suggested, markets do not provide these co-benefits of food distribution, then the ability of non-market institutions to provide them is presumably hampered by acting like market institutions. If the food pantry adopts the aesthetic standards of a supermarket, for example, it will be unable to make use of what the supermarket discards for aesthetic reasons. And contrary to the relationships of resilience associated with non-market distribution, emulating markets means constructing a psychological environment not just of anonymity, independence, and choice but of self-interest, isolation, and calculation (Bowles, 1991). In market settings, people act in ways that they would consider unethical in any other setting (Falk & Szech, 2013). Merely prompting people to think about money in experiments makes them generally less generous, cooperative, caring, and warm (Vohs, 2015). It comes as no surprise that interviewees identified the relationships of care and resilience that emerged from their projects as values specific to non-market foodways.[12]

We are not arguing against selling food as such. We are cautioning against *pretending* to sell food. When the fake-supermarket model includes prices and budgets, for instance, it can reinforce stigma about poor people not knowing how to manage their money (Andriessen et al., 2022). What if, rather than mimicking markets, charities were to emphasize their advantages as non-market distributors: caring relationships, community resilience, waste reduction, and the notion that food should be free? And if charity is founded on inequality, how might non-market food institutions transform so as to realize the dignity of distributing food among equals?

The Equality of Sharing

Exchanging gifts as equals is not straightforward in an unequal world. It is to be emphasized that when people's roles are fixed as givers and receivers, gifts make hierarchies. It is insulting to channel surplus food exclusively to the poor. When volunteers and recipients cook together or eat at the same table, on the other hand, they approach the "dignity of equality." But it is unrealistic to expect that people with large differences in means can engage in reciprocal gift exchange, where what is given and received approach rough equivalence over time.[13] Instead, non-market food networks can work toward equivalence in *willingness* to give. This, again, is the defining characteristic of what Graeber somewhat provocatively called communistic sharing (2009). Sharing is an everyday, non-ceremonial resource conveyance that is not necessarily reciprocal and ideally does not come with hidden obligations (Belk, 2010). People tend to share resources in this way among family and in mutual aid networks.

Rather than imitating supermarkets or restau-

[12] To be clear, of course purchasing food connects the buyer to the seller, distributor, grower, and farmland; our argument, based on our interviews and in line with Marx's (1867/1977) concept of "commodity fetishism," is that markets tend to make these relationships ephemeral and invisible—the shopper need only see a product and its price. (Gunderson argues that local, organic, and fair-trade markets exacerbate rather than ameliorate this tendency (2014).)

[13] Another way of thinking about this issue is that reciprocal giving cannot help the poor, as those who have little to give end up receiving little as well (Komter, 1996).

rants, food charities can learn from groups that practice non-hierarchical, communistic sharing. Egalitarian societies often have norms that intentionally counteract concentrated social power, such as the custom of insulting the meat shared by skilled young hunters in order to suppress feelings of superiority (Lee, 2013). South American chiefs tend to have no authority to give orders but instead the obligation to work nonstop to acquire gifts, often of food, for their clan (Clastres, 1974/1989). In modern societies, mutual aid collectives exist to direct resources toward unmet needs, typically without structures separating givers from receivers. Food Not Bombs, for example, is a movement of "anarchist soup kitchens" that share rescued food in public spaces of cities around the world (Giles, 2021). Chapters are supposed to make decisions by consensus. In practice, these groups work to empower anyone involved to make operational decisions autonomously, encouraging folks to ask comrades for advice rather than seek directives.[14] To avoid infantilizing recipients, mutual aid groups go beyond offering consumer choice, such as a menu from which to order, instead inviting all comers to participate in decisions like shaping the menu itself (Sbicca, 2014). Tellingly, participants call mutual aid "solidarity not charity" (Spade, 2020). Mutual aid networks we encountered in the Brattleboro area clearly strived toward these ideals.

Might charitable food institutions transform into something like food recycling-and-regifting depots where people of all social classes work, eat, and self-govern? Critics of food charity, for their part, celebrate emergency food providers that reinvent themselves as "community food centers" focused on relationships (Fisher, 2017, p. 35; Poppendieck, 1998, pp. 315–317). What might it take to morph a culture of charity into a culture of sharing or solidarity?

We can only eat excess as equals if everybody has some. Most affluent people, however, would not think to eat what is on offer at a food pantry, soup kitchen, or supermarket dumpster, which would mean choosing to have less choice and breaking the taboo around contact with waste (Barnard, 2016). But what if those practices were seen the same as foraging in the woods or buying what is in season? Marketing has trained consumers to be suspicious of waste, but eating rescued food could, in principle, be considered dignified because it is a public service and a frugal act, making use of resources that have already been spent. We hypothesize that if well-off individuals receive salvaged, non-market food from the institutions that collect and distribute it, the experience is less stigmatizing for all recipients.

But is there enough non-market food for more people to incorporate it into their diets? Potentially, yes. Critics of food charity sometimes express concern that the streams of surplus might dry up as farms and factories fix the inefficiencies that generate consistent donations (Fisher, 2017; Galli et al., 2019), but that has not happened: the nation's largest network of food banks diverts four times more food waste than it did a quarter century ago (Feeding America, 2022a). This is still only 3% of the mass of U.S. food waste, which is, in nutritional terms, more than 1,000 calories per person per day (Buzby et al., 2014).[15] Commercial food systems produce plenty of food that is good to eat but not profitable to sell (Barnard, 2016; Lindenbaum, 2016).[16] Because of the enormity of

[14] Disclosure: the lead author of this paper works with their local Food Not Bombs chapter. There is no citation for this claim because it is a finding from participant observation.

[15] Smaller-scale studies find that businesses donate less than 10% of their edible excess (Griffin et al., 2009; Stuart, 2009). About 8% of commodity crops planted in the U.S. never get harvested (USDA, 2023), and even small farms have to plow crops under for economic reasons and sort out produce that does not meet aesthetic standards.

[16] Activists claim that modern capitalism has to waste food because of overproduction (Barnard, 2016). Industrial agriculture produces enormous abundance but needs some degree of scarcity to keep prices up. At the same time, capitalists hold wages down in pursuit of profit, and thus consumers cannot buy up all that is produced anyway. More to the point, economic reasoning suggests that throwing food away is profitable. Since food is a necessity, the demand for food is price-inelastic (Andreyeva et al., 2010; Green et al., 2013): when food prices increase, consumers decrease the total quantity they purchase by less, in percentage terms, than the magnitude of the price hike. In other words, a 10% price increase would result in less than a 10% decrease in demand. Thus, when the price goes up, total revenue goes up too. Throwing away food does exactly this. So even if the cost of disposal is the same as the cost

excess, receiving free food need not mean taking it away from the hungry.

Expanding non-market food while substituting charity with solidarity could engender more of the benefits specific to food that is not for sale—relationships, resilience, food rescue—but we do not mean to suggest that it is sufficient to address hunger. Charity's critics make an airtight argument that anti-poverty measures are the best anti-hunger measures. They insist that local food sharing cannot end hunger because hunger is caused by global political-economic structures (Allen, 1999).

However, there is evidence that a culture of sharing can ameliorate the worst effects of food insecurity (Adams, 1993). In small-scale societies, sharing ensures that nobody goes hungry unless everybody does. Whereas critics of charity see a "retreat from national standards to haphazard local provision" (Poppendieck, 1998, p. 12), local groups might respond that they are best positioned to witness and respond to local need with local resources—and they would not be wrong (Lentz et al., 2013). Large-scale anti-hunger policies and community-level non-market food distribution are complements, not competitors.

Moreover, food sharing can contribute to fighting poverty if it allows people to interact as equals across classes. People who are not poor themselves may be more likely to take part in anti-poverty activism when they see the poor as people like them, who should not be mistreated or discounted (Miles, 2007). For that, the well-to-do need to identify with the poor, not just serve them.

If anti-hunger work turns to food justice activism (Dixon, 2015), the enormous network of emergency food provisioning can shift toward food sharing that, while it may alleviate hunger, does not pretend to "solve" it. The dilemma is that without the myth that they are solving hunger, corporations and individuals would probably not donate so much food, money, and time to maintain the food rescue-and-redistribution network that exists.

Nevertheless, based on our findings we recommend sharing food. Many cities have prohibitions on public food sharing that limit the circulation of food to two possibilities: a private affair or a market transaction (Giles, 2021). Even without prohibitions, market culture enforces this norm. Charity challenges this paradigm by giving away food on a large scale. Even though charity is at worst stigmatizing and at best still not up to the task of ending hunger, it provides benefits that are specific to non-market foodways. Because of these benefits, we caution against throwing the non-market baby out with the charitable bathwater, so to speak.

Conclusions

In *Beginning to End Hunger*, Jahi Chappell (2018) describes how the city of Belo Horizonte, Brazil, cut malnutrition in half by setting up subsidized People's Restaurants, low-cost grocers, and local farmstands—all institutions that sell food (Lappé, 2011). In a city rife with poverty, it would seem that food should be free in order to be accessible to the poorest of the poor. Chappell, however, responded that in a market economy, participation in the market means dignity (personal communication, September 12, 2018). "Food with dignity" became a motto in Belo Horizonte.

In a sense, Chappell is right. In this unequal, capitalist world, it is easier to create the dignity of commerce than to give gifts as equals. After all, it was poor and hungry people, not scholars or food bankers, who first said that receiving free food is stigmatizing. Lewis Hyde called charity a "decoy, providing [the recipient] his daily bread while across town someone is buying up the bakery" (1979, pp. 179–180). Today's critics of food charity add that it is a distraction from actually working to end hunger.

But we contend that food charities, as today's major non-market food institutions, serve several functions that may be worth preserving. We found that non-market food distribution strengthens relationships, fosters local resilience, makes use of edible food that is not profitably sellable, and aligns with an alternative, non-market vision of a

of getting food to market (it is probably actually less), profits go up. Indeed, governments and the food industry have repeatedly culled livestock and destroyed crops at outrageous scales to keep prices high (Poppendieck, 1986). Our analysis suggests that wasting food to increase profits is an invisible, everyday occurrence.

desirable future foodscape. Some interviewees even ascribed magical qualities to food that is not for sale. These are advantages specific to institutions that distribute food in ways other than selling it.

So, how might society construct non-market food institutions that continue to generate the relationships, resilience, food recovery, and values-alignment that interviewees of this study described to us, but that do not depend on destitute people to consume the food? Our discussion points toward possibilities for reducing stigma by sharing food as equals rather than giving it away as charity. Everybody can incorporate more non-market food into their diets. Directing free food only to poor people, even without formal means testing, contradicts the equality implied by the universal need to eat.

Further research exploring non-market foodways might uncover more benefits specific to these practices. Documenting the prevalence and power of non-market production and distribution contributes to our understanding of the diversity of economic practices in a world that is often analyzed as if it were singularly capitalist (Gibson-Graham, 2008). We suspect that virtually everybody shares food at least occasionally.

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Appendix A. Interview Questions

1. History

First we want to ask you about your role in the community.

A. What do you do here [at this organization, garden, homestead, etc]?
    a. [If they talk about what the organization does, ask:] What do you do here?
B. How long have you been [involved/doing this]?
C. How did you first get started?
D. Have you perceived [____] change over time?
    a. How has your involvement in [practice] changed over time?
    b. Has COVID had any influence in these changes?

2. Distribution

[If they work for a distribution institution] Now I am going to ask you a little more about [institution].

A. How does sharing food here work?
    a. Where do you get the food you distribute?
    b. Who all is involved? Do you have any partners or collaborators?
B. Who receives this food? Who eats it?
    a. How is that determined? Who decides?
C. Has the distribution of food at this institution, or organizations like it, changed in your lifetime?
D. What's important to you when distributing food at no charge?
    a. What do you care about when you're sharing food with the community?
E. Do you have experience selling food?
    a. [If yes] How does selling food compare to distributing it with no cost?
    b. [If no] In what circumstances would you sell food, if any?

3. Production

Now, we are going to ask you more about the ways you grow and harvest food that's not for sale, the first question on that survey you filled out.

A. Tell me more about [whichever non-market production practices participant partakes in, e.g. foraging, gardening, hunting].
    a. Any good stories?
    b. How long have you been doing it? How did you learn?
B. Who do you [garden/hunt/fish/forage/etc] with?
C. Who gets the food you produce? Who eats it?
D. Why do you produce food that's not for sale?
E. What's important to you when you are [gardening/fishing/hunting/etc]?
    a. What do you care about when [doing practice]?
F. Do you also sell food you produce? [If yes, ask…]
    a. How much of it? Which?
    b. How does producing food for sale compare to producing food you don't sell?
    c. [If no] In what circumstances would you sell the food you produce, if any?
G. Whose land do you grow food on? Or …harvest food from?

4. Access

Now we want to talk about the second question on the survey, how you get food other than buying it.

A. Tell me about [whichever non-market access practices participant partakes in].
    a. How long have you been doing that?
    b. Any good stories?
    c. How does this compare with buying food?

[If they share/gift/barter] Let's talk specifically about informal exchange -- sharing, gifts, and barter.

B. Why do you partake in those types of transfers?
C. Who do you do these informal food exchanges with?
    a. From whom do you receive food?
    b. Who do you give food to?
D. How does [sharing/gifts/bartering] work?
    a. Has this changed over time?
    b. [For barter] Is what you give and what you receive of equivalent value?
E. What's important to you when you are [sharing or bartering food]?
    a. What do you care about?
F. What does food accessibility mean to you?
    a. Does this relate to accessibility to land/ water/ resources?

5. Relationships

How do these non-market food practices affect your relationships, if at all? Be specific.

A. Relationships with people
    a. People you [garden/hunt/forage/fish/work] with
    b. People who you give food to, or from whom you receive food
B. What about relationships with your food?
    a. And the plants and animals who become your food
C. Your relationship with this place, its ecosystems?
D. How about your relationship with yourself?

6. Final thoughts

A. Is there anything you would like to add?
    a. Something you haven't got the chance to mention
    b. Something you want to elaborate on
    c. Something we should be aware of

Appendix B

Table B1. Demographics of Interviewees

19 of 25 participants filled out the survey.

ID	Birth Year	Gender	Race	Ethnicity	Political Identity	Housing Status	Income Bracket (in US$)
1	1943	Female	White	NOT Hispanic, Latino, or Spanish origins	Democrat	Rent	—
2	1945	Female	White	NOT Hispanic, Latino, or Spanish origins	Democrat	—	$100,000+
3	1975	Non-binary	Black or African American	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Rent	$25,000–$50,000
4	1996	Male	White	—	Democrat	Rent	$50,000–$75,000
5	1995	Female	White	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Rent	$75,000–$100,000
6	1950	Female	White	—	Democrat, Progressive	Own	$75,000–$100,000
7	1982	Male	White	NOT Hispanic, Latino, or Spanish origins	Independent	Rent	$50,000–$75,000
8	—	—	White	—	—	Homeless	$0–$10,000
9	1969	Female	White	NOT Hispanic, Latino, or Spanish origins	Democrat	Rent	$50,000– $75,000
10	1973	Female	White	NOT Hispanic, Latino, or Spanish origins	Independent	Own	$25,000–$50,000
11	1965	Male	White	NOT Hispanic, Latino, or Spanish origins	Democrat	Own	$100,000+
12	1992	Female	White	NOT Hispanic, Latino, or Spanish origins	Progressive, Anarchist	Rent	$25,000–$50,000
13	1996	Non-binary	White	NOT Hispanic, Latino, or Spanish origins	Progressive	Rent	$10,000–$25,000
14	1981	Female	White	NOT Hispanic, Latino, or Spanish origins	Democrat	Own	$25,000–$50,000
15	1972	Male	White	—	Not affiliated	Own	$50,000–$75,000
16	1963	Female	White	NOT Hispanic, Latino, or Spanish origins	Democratic Socialist		$25,000–$50,000
17	1976	Female	White	NOT Hispanic, Latino, or Spanish origins	Progressive	Own	$75,000–$100,000
18	1980	Female	White	NOT Hispanic, Latino, or Spanish origins	Progressive, Independent	Own	$50,000–$75,000
19	1959	Male	Two or more races	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Own	$25,000–$50,000

Table B2. Tally of Interviewee Participation in Non-Market Food Production

Number of participants (from 19 total) who did each of the following activities in the year preceding study.

Home Garden	Community Garden	Chickens for Eggs	Beekeeping	Other Livestock	Foraging	Fishing	Hunting	Maple Syrup
15	8	6	0	2	3	3	2	4

Table B3. Tally of Other Non-Market Food Accessed by Interviewees

Number of participants (from 19 total) who got free food from each of the following sources in the year preceding study.

Community Meals	Soup Kitchen	Food Pantry	WIC	Barter	Sharing or Gifts	Gleaning	Dumpster Diving	Donations
9	3	6	2	5	13	4	3	1

Appendix C. Institutions Profiles and Non-institutional, Non-market Food Practice

Institutions

What follows is a short description of the institutions in which people we interviewed were involved. Institutions' profiles summarize how they distribute food and generally function.

Agape Christian Fellowship Food Pantry

Every Thursday from 5:30 to 7 pm, volunteers give out grocery boxes they have prepared. They "don't say no to anyone" who comes looking for food. The grocery boxes are useful only to households with kitchens. The pastor delivers some boxes to households that cannot pick one up. The pantry can serve about 40 families a week. Church members share info about the pantry mostly over Facebook.

Ames Hill Brook Community Garden

Some of the core group that started this garden in West Brattleboro's Stockwell Park still participate. The 22 plots, each 5 feet by 25 feet, are rented out yearly for $25. Some gardeners live in the neighborhood. No gardeners sell their produce, but some have shared it with the public from a table by the road. The garden has become a landscaping project that has rejuvenated the park.

Atowi Project

Rich Holschuh dreamed up and now directs the Atowi Project. His mission is to raise awareness of Abenaki needs and struggles. The project aims to educate first tribal members and then the broader community about cultivating and gathering traditional foods. Atowi is about reconnecting the region's Indigenous peoples to their land, communities, and practices. The Retreat Farm and Vermont Foodbank have contributed resources.

Edible Brattleboro

Edible Brattleboro aims to grow food everywhere for everyone. They plant and tend gardens and fruit trees all around town, often partnering with the owners, residents, or managers of the land. They communicate to the public about these edible plants with signage and green flags that mark produce ready to harvest. Volunteers share produce from Edible Brattleboro's gardens and produce gleaned from the farmers market at their weekly Share the Harvest farmstand. Anyone can receive food for free. There is a jar for cash donations, though. The group also hosts workshops to teach people how to cook and preserve seasonal vegan foods.

Everyone Eats

This statewide program pays restaurants $10 per meal for meals to be distributed for free to anyone who has been "negatively affected" by the pandemic. Ten percent of the total cost of ingredients must be local. What started as local projects in the Burlington and Brattleboro areas scaled up to 14 distribution hubs around Vermont with CARES Act funding. Now funded by FEMA, Everyone Eats meals in the Brattleboro area are delivered from restaurants to their hub and then to partner organizations that distribute them.

Foodworks

Foodworks is the Brattleboro food pantry of the organization Groundworks. Like many food pantries, it shifted from in-person shopping to distributing pre-made grocery boxes during the pandemic. Now, anyone can fill out a form with their preferences and pick up two weeks' worth of food during open hours on Monday, Wednesday, Friday, and the last Saturday of the month. Foodworks delivers to households that cannot pick up groceries on Tuesdays. They take people's names but do not require identification.

Loaves & Fishes

Located in the basement of the Centre Congregational Church in Brattleboro, Loaves & Fishes distributes food to "anyone who's hungry" every Tuesday and Friday. They served sit-down meals, like any soup kitchen for the 35 years before COVID-19. Now, they serve the same food in to-go containers, plus grocery bags, Everyone Eats meals, and other items. Volunteers prepare separate grocery bags for cooking recipients and for non-cooking recipients, most of whom do not have access to a kitchen. They also run deliveries to partner organizations and households that have requested food.

Nicole's Community Kitchen
Early in the pandemic, Nicole began cooking meals in her own kitchen for people who needed them, "100% free, no questions asked." Her one-person cook-and-delivery team eventually expanded into a team of volunteers as more people requested meals through social media, email, or the website. At its peak, Nicole's Community Kitchen was delivering 600 to 700 meals a week to people's homes. The nonprofit dissolved in early 2021 because it lacked financial and administrative support. Nicole's Community Kitchen is now a commercial enterprise that sells meals, but also still produces a few free meals a week for neighbors in need.

Putney Food Shelf
Volunteers and staff give out groceries on Mondays from 9 to10:30 am. Anyone can drive up or walk up, fill out a form with their preferences, and get a grocery bag. Recipients do not have to give any information. Volunteers deliver food to ten households who cannot make it to the pick-up. The Putney Food Shelf, like other food pantries, is beginning to plan its transition back to in-store shopping.

Putney Mutual Aid
A group of people and organizations formed Putney Mutual Aid at the beginning of the pandemic. People would make requests over social media or email, while others would offer help. Coordinators would match volunteers with requests. Volunteers would buy groceries, but typically just as a delivery service to quarantining households or elderly folks; the person requesting would pay them back. Similar mutual aid groups arose all over the region, some of which did provide food as a gift: Brattleboro Area Mutual Aid, Dummerston Cares, Guilford Cares, West River Valley Mutual Aid. Some became advocacy groups, organizing politically to pressure governments to address unmet needs, while others, like Putney Mutual Aid, remained in the realm of "neighbors helping neighbors," which allowed extremely progressive and extremely conservative people to coexist and cooperate.

Retreat Farm
The Retreat Farm is a community institution in Brattleboro. Families have long come to visit the petting zoo. The pandemic accelerated their planned transition toward farm education in service of expanding food access. In its first iteration, the community food project purchased groceries for the farm's Open Barn Members who qualified for SNAP, WIC, or free school meals. The program grew from 25 bags to around 60 bags a week. They put leftover veggies up for grabs on the porch of their new farmstand. They gathered food donations from several organizations and businesses into 100-lb holiday boxes. For winter, the farmstand became a 24-hour, open-air pantry where anybody could receive food. Currently, it operates as a pay-what-you-can, self-checkout farmstand, where customers can choose between paying full price, half price, or nothing.

St. Brigid's Kitchen and Pantry
A project of St. Michael's Catholic Church, St. Brigid's operates in a house across the street. They have served lunch five days a week since the early 1980s. A different team prepared a meal each weekday. These meals are distributed from the house's front door. There is "no criteria" limiting who can receive food. A few volunteers deliver meals, mostly to elderly households in the area. St. Brigid's thus provides low-sodium and diabetes-friendly food options. A small shed by the street serves as a 24-hour free pantry, stocked with bread, produce, and non-perishables for anyone. Once a month they hand out grocery boxes at a drive-up pantry event.

SUSU CommUNITY Farm
SUSU is an Afro Indigenous-stewarded farm and land-based healing center addressing food apartheid. In 2021, a farm manager and volunteers grew vegetables at a plot at Retreat Farm. A network of volunteers delivered this produce, plus food donated by and purchased from local farms and organizations, to 35 BIPOC families in Windham County every Wednesday for 22 weeks during the summer. These Boxes of Resilience were "always full" and "pretty deluxe," according to the farm manager, which they attributed to food's abundance. They grew crops that box recipients had requested, and strive to make culturally relevant food readily available.

Vermont Foodbank
The local Vermont Foodbank distribution center distributes donated, gleaned, and cheaply bought bulk food items to their network partners. They have a shopping list from which their partners can order. Organizations must apply to become network partners. They can then distribute food they buy and receive for free from the Foodbank according to their own norms. Workers at partner organizations are only allowed to receive the food as "just another client." The Foodbank also distributes food from its Veggie Van Go and mobile pantry programs. The Vermont Foodbank makes grant funds available to their network partners and any organization addressing root causes of hunger.

Vermont Wilderness School
This nonprofit provides nature connection mentoring to people of all ages. It offers apprenticeships for tracking, foraging, and hunting. Vermont Wilderness School also hosts summer camps and workshops that delve into more philosophical topics. The aim is to connect participants to themselves and to the other-than-human world, including through harvesting wild food in ethical and reciprocal ways. The School prioritizes gift economies, often practicing and teaching giving away one's first harvest, either to other people or simply back to the land.

Practices
Below, we describe each non-institutional, non-market food practice we encountered in our research.

Gardening
Many Brattleboro-area residents grow vegetables and fruit at home. There are educational and productive gardens at many local schools. People without access to land at home grow in community gardens at Saint Ames Brook, the Retreat Farm, and other sites. At these community gardens, gardeners tend individual plots but must manage tools, water, pests, and weeds collectively. Edible Brattleboro, and possibly others, garden collectively in public places for anyone to harvest. Gardeners who know each other sometimes pick each other's plots when things are ripe and unharvested.

Livestock raising
People keep animals for meat, dairy, and eggs. Many of these products are consumed within the household or shared, gifted, and bartered. One homestead we talked to has been raising chickens for the past 20 years. They preserve some of the eggs and move their coop around to fertilize different pieces of land.

Sugaring
Commercial sugarers direct some of their maple syrup to home consumption and sharing. Farmers who tap maple trees on one woman's land give her syrup, and she gives a lot away in turn. There are, in all likelihood, entire sugaring operations in the area that do not sell their product. These are probably small-scale.

Gleaning
Farmers often have leftover produce in their fields that they could not profitably harvest. Or they have edible food in storage that cannot be sold. Farmers often offer this produce to people and groups who are willing to harvest and distribute it. The Foodbank's gleaning program sends teams of volunteers harvest vegetables at numerous partnering farms.

Foraging
Gathering wild edibles can be an educational activity, a hobby, or a significant contributor to one's diet, whether nutritionally or emotionally. People forage nettles, fiddleheads, garlic mustard, ramps (wild leeks), berries, and mushrooms of many varieties. One homesteader would even forage for seaweed in Maine and bring it back to use on their soil.

Hunting
A few locals report eating only meat that's hunted. Others grew up getting much of their protein from hunted animals. Hunters frequently gift and barter meat from the animals they take. Or they freeze it to feed their household for months.

Fishing
A man fishing under the Bridge Street bridge reported fishing for both sport and subsistence. He does mostly catch-and-release but will kill any animal he wounds and process it for cooking or freezing. There is some concern over the safety of eating fish that have been caught in the Connecticut River.

Roadkill
Some people harvest and process roadkill for meat and, when it's a large animal like a deer, share that food widely. Vermont game wardens distribute collected roadkill to families who have asked to be on their list for such distribution.

Dumpstering
Folks also rescue food directly from the waste streams of grocery stores and other food businesses. Some people even dumpster dive from Foodworks' waste stream. We recovered pita bread, pizza crusts, jarred asparagus, and off-brand pop tarts from a dumpster behind a dollar store. One Brattleboro resident who has relied on dumpster diving for much of their diet declined an interview, even though it would be anonymous, because they did not want to draw more attention to dumpster diving. Perhaps this was not wanting to attract more scavengers to their spots, but probably not in response to any scarcity of discarded food -- dumpsters are bountiful -- but instead because when people make a mess or a scene, store managers lock up the bins. The organic bins behind the Hannaford on Route 5 are surrounded by a fence with a locked gate and a "Keep Out" sign. Vermont dumpster divers know the compost at most Hannaford locations as a prime food source.

Gifts
People bring gifts of food when visiting neighbors, friends, and family. They say they expect nothing in return, but in practice such gift relations tend to be reciprocal. One woman, a recovering heroin user, said, "I don't eat seafood. But I like fishing." She gives away the fish to her mostly elderly neighbors at a housing authority apartment complex in West Brattleboro.

Sharing
This woman also helps a friend who hoards food, because of previous experiences with scarcity, to separate out food he will not eat and then bring it to the community room, where other residents go through it. She says it helps; not everyone can get to the store easily. Another woman says that she would put vegetables from her front yard garden in a "help yourself" basket. Most people would take the produce and leave nothing, while others would leave money, or other vegetables they had grown. There has been a table by the road where gardeners at Ames Brook Community Garden give away extra vegetables.

Barter
Friends and close acquaintances sometimes trade goods and services in kind. Impromptu exchanges occur too. Vendors barter with each other at the Brattleboro Farmers Market. One cheesemaker exchanges cheese for cups of coffee from the coffee stand each week. They once swapped a block of artisanal cheese for a bouquet from a florist. Homesteaders also barter, mostly with their neighbors, trading what they have in abundance that their trading partner lacks for things they lack that their counterpart has in abundance. This then comes to a "balance" and can create a "sense of homeostasis in the community."

Appendix D

Table D1. Demographics of Interviewers

The six authors of the paper filled out the same surveys as did participants.

ID	Birth Year	Gender	Race	Ethnicity	Political Stance	Housing Status	Income Bracket
1	1991	Man	White	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Rent	$10,000–$25,000
2	2000	Female	White	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Rent	$0–$10,000
3	1980	Female	White	NOT Hispanic, Latino, or Spanish origins	Not affiliated	Own	$25,000–$50,000
4	2000	Female	White	NOT Hispanic, Latino, or Spanish origins	Democratic Socialist	Rent	$100,000+
5	2000	Non-binary	White	NOT Hispanic, Latino, or Spanish origins	Anarchist	Rent	$0–$10,000
6	2000	Female	White	Hispanic, Spanish, or Latino origins	Not affiliated	Rent	$25,000–$50,000

Table D2. Tally of Interviewer Participation in Non-Market Food Production

Number of researchers (from 6 total) who did each of the following activities in the year preceding study.

Home Garden	Community Garden	Chickens for Eggs	Beekeeping	Other Livestock	Foraging	Fishing	Hunting	Maple Syrup
5	2	4	0	0	4	1	0	1

Table D3. Tally of Other Non-Market Food Accessed by Interviewers

Number of researchers (from 6 total) who got free food from each of the following sources in the year preceding study.

Community Meals	Soup Kitchen	Food Pantry	WIC	Barter	Sharing or Gifts	Gleaning	Dumpster Diving
6	1	1	0	3	6	5	1

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Nourishing student success and wellbeing: Unveiling the impact of food environments on student food security challenges through a case study from Montana

Teresa Warne,[a] Roland Ebel,[b] * and Selena Ahmed [c]
Montana State University

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Abstract

Food insecurity among U.S. college and university students surpasses respective levels in the general population. Previous research has primarily focused on demographic and economic explanations, neglecting other risk factors such as student place of residence and specific food environments. In addition, most studies have been conducted before the COVID-19 pandemic, which further exacerbated food security challenges. To address these gaps, our comprehensive case study at Montana State University (MSU) assessed risk factors for student food insecurity, considering food access and the students' food environments. From March to November 2020, we collected online survey responses from a diverse sample of 443 MSU students. Approximately one–third experienced food insecurity during this period, with their food insecurity status linked to housing type and academic level. Despite students' reported knowledge of healthy diets and cooking skills, consuming inadequate and insufficient food had a significant impact on their dietary quality, well-being, and physical and mental health. Just under half of the surveyed students (44%) reported increased difficulties in accessing food due to the pandemic. Addressing food insecurity among college students is crucial for their well-being and academic success, not only because of additional stressors such as COVID-19. Dealing with food

[a] Teresa Warne, Graduate Student, Department of Health and Human Development, Montana State University

[b] * *Corresponding author:* Roland Ebel, Assistant Research Professor, Sustainable Food Systems Program, Department of Health and Human Development, Montana State University; Reid Hall 345; Bozeman, MT 59717 USA; +1-406-994-5640; roland.ebel@montana.edu

[c] Selena Ahmed, Associate Professor, Department of Health and Human Development, Montana State University

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insecurity requires improving economic situations and creating a reliable and diverse food environment that ensures affordable, healthy, safe, convenient, desirable, and sustainable food options. Special increased support from universities and governments should be given to students living off-campus. By recognizing these unique challenges and implementing targeted interventions, we can foster a supportive food environment for students.

Keywords
food access, food systems, food insecurity, college students, higher education, student housing, COVID-19, pandemic

Introduction

The 21st century is witnessing global disruptions that significantly challenge the food security of diverse populations. Pandemics, political conflicts, economic crises, crop and livestock diseases, and climate change threaten the stability of agri-food supply chains. These disruptions have highlighted the interdependent nature of food systems at local, regional, national, and international scales. Fragmented interactions within these supply chains exacerbate shocks and amplify risks, particularly for the most vulnerable populations.

Alongside low-income, rural, and other marginalized populations, U.S. university and college students have consistently faced a higher prevalence of food insecurity (Freudenberg et al., 2019; Nikolaus et al., 2020). The disproportionate experience of food insecurity among students has been frequently attributed to their added financial burden upon entering college or university. Besides tuition, many students need to split their budget among rent, utilities, healthcare, and food, with the latter often taking less priority among mounting financial burdens, thus increasing the risk of food insecurity (Henry, 2017). The first study of U.S. student food insecurity, in 2007 at the University of Hawaii-Manoa, found that 21% of students there struggled with food insecurity (Chaparro, 2007). After the Big Recession, numbers seem to have increased: in a 2011 study at City University New York, 40% of surveyed students were reported as food insecure (Freudenberg et al., 2011); in 2014, at Western Oregon University, the share was 59% (Patton-López et al., 2014), and in a 2015 study conducted at Arizona State University, 34% of students were food insecure. Other studies have reported similar findings (Chaparro et al., 2009; Freudenberg et al., 2019; Gaines et al., 2014; Hughes et al., 2011). The majority of these studies assess the economic causes and consequences of student food insecurity, generally emphasizing student financial situations and addressing subsets of student populations, such as students from ethnic minorities. However, little research has been conducted on other dimensions of the food insecurity equation. Some research, primarily case studies from individual U.S. colleges, assesses student diet quality (Bruening et al., 2016; Chaparro et al., 2009; Deliens et al., 2014; Hughes et al., 2011; Larson et al., 2020; Matthews et al., 2022; Powell et al., 2021) and overall access to food (Bruening et al., 2016; Greaney et al., 2009; Martinez et al., 2018; Patton-López et al., 2014; Waity et al., 2023). However, most of these studies neglect the bigger picture, the food environments in all their complexity that surround students. Food environments include internal (accessibility, affordability, convenience, and desirability) and external (availability, prices, vendor and product properties, marketing, and regulation) domains (Turner et al., 2018). The way each student experiences these domains is influenced by their individual determinants of health, including social determinants.

In addition to this research gap, the occurrence of the COVID-19 pandemic, an unprecedented natural experiment in the context of a globalized economy, presented a unique additional challenge for students, affecting their access to food, diets, and overall lifestyles, livelihoods, and wellbeing (Davitt et al., 2021; Sidebottom et al., 2021). First studies of the pandemic indicated contradictory effects on student food security, with improvements for some and increased challenges for others (Davitt et al., 2021; Owens et al., 2020). We consider it crucial to explore the underlying causes of this ambiguity, and, more important, the mid-term consequences of an event like the COVID-19 pandemic on student food security. Thus, our case study aimed to explore the accessibility of food environments and the accompanying resources that affect food security among university students,

with specific emphasis on the impact of the COVID-19 pandemic.

This study was conducted in Montana, a large rural and agricultural state in the Northwestern U.S., at Montana State University (MSU). It is situated in Bozeman, a college town evolving into a small city that is currently characterized by high rental prices and low housing supply. We administered a structured survey to MSU students during Fall 2020, just as the strictest university and governmental pandemic regulations were being phased out in Montana (Ebel & Byker-Shanks, 2022) and students were returning to campus. The survey addressed the following research questions concerning MSU Bozeman students: (1) What characterizes student food access and food environments? (2) Which associated resources support student food security? (3) How were food access and food environments affected by the COVID-19 pandemic? (4) How do food access and food environments differ based on student demographic characteristics? It is hoped that our findings can be applied to design and implement programs at MSU and similar universities to strengthen food environments and enhance access to resources that will better support student food security.

Definitions

The survey instrument and study discussion make use of important food system concepts, including food insecurity and food security, sustainable diet, food environment, and resilient food system. We will briefly define them.

In alignment with the definition by the UN Food and Agriculture Organization [FAO], *food insecurity* is defined by the U. S. Department of Agriculture as the lack of consistent access to enough food for every person in a household to live an active, healthy life. Food insecurity includes food insecurity with hunger (very low food security) and food insecurity without hunger (low food security) (U.S. Department of Agriculture Economic Research Service [USDA ERS], 2022). *Food security* is defined as access by all people at all times to enough food for an active, healthy life (USDA ERS, 2022). In the U.S., food security and food insecurity are measured by the U.S. Household Food Security Survey Module, or an adaptation of the survey module to fit the context, such as households with or without children, or a shortened version to take account of reduced respondent burden (USDA ERS, 2022).

The FAO (2008) has identified four dimensions of food security: availability (whether food is locally produced or imported), accessibility (whether a consumer is able to reach food or has the economic means to procure it), utilization (whether food is safe to consume, or the consumer has the skills to prepare food in a manner that is safe and culturally relevant), and stability (whether the consumer, household, or nation is equipped to counter food system shocks such as natural disasters and political crises). Sustainability as a fifth dimension of food security has more recently been considered, especially the relationship between environmental sustainability and long-term food security (Berry et al., 2015). This includes the impact of biodiversity loss on food security or ecosystem services that support thriving agricultural systems (Bélanger & Pilling, 2019).

Sustainable diet has been defined as safeguarding ecosystems, optimizing natural and human resources, and providing diets that are culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe, and healthy (Burlingame et al., 2012; FAO, 2010). Sustainable diets are being increasingly promoted in recognition of the interconnected challenges of food production, procurement, preparation, consumption, and waste (Burlingame et al., 2009; Davis et al., 2021; Springmann et al., 2018). Approaches to fostering sustainable diets acknowledge the ecological, economic, human health, sociocultural, and political dimensions linked to food access and dietary choices (Ahmed et al., 2019; Jones et al., 2016). A diet that does not support food security is defined as not sustainable (Berry et al., 2015).

The *food environment* is a critical site to advance sustainable diets, as it includes all factors that influence consumer food procurement (Downs & Demmler, 2020). It is defined as the consumer interface with the food system that encompasses the availability, affordability, convenience, promotion and quality, and sustainability of foods and beverages in wild, cultivated, and built spaces that are influenced by the socio-cultural and political

environment and ecosystems within which they are embedded (Downs et al., 2020). Built food environments include market food environments such as hypermarkets, supermarkets, food banks, and formal farmers markets, as well as food services such as restaurants and cafes (Ahmed et al., 2020; Downs et al., 2020). Natural food environments encompass wild and cultivated food environments. Wild food environments comprise forests, open pastures, and aquatic areas, and cultivated spaces include agricultural areas, ranging from garden containers and backyard gardens to large-scale production; consumers directly procure food from both types of environment (Downs et al., 2020; Kelly et al., 2011). While most food environment research emphasizes built food environments, natural food environments are equally important to recognize as rural communities continue to access food for direct consumption to support their food security, nutrition, and health, particularly in the context of food system shocks such as the COVID-19 pandemic (Ahmed et al., 2020; 2022).

Discussion of *resilient food system*s has increased as a response to global temporary food supply chain disruptions because of the COVID-19 pandemic (Naja & Hamadeh, 2020). Resilient food systems are generally defined as those that can withstand and adapt to economic, social, and environmental shocks while ensuring equitable access to sufficient, affordable, safe, nutritious, and culturally relevant food for all (Tendall et al., 2015).

COVID-19 and U.S. Food Security

Food insecurity and its underlying social inequities have been persistent problems in the U.S., and the COVID-19 pandemic exacerbated all dimensions of food insecurity, from availability and access to food to social and racial disparities (Niles et al., 2020; O'Hara & Toussaint, 2021). In the Spring 2020, a substantial percentage of low-income adults in the U.S., including students, experienced food insecurity, reaching 44% in March 2020. Minority communities faced the most severe food security challenges (Huizar et al., 2020; Morales et al., 2020; Wolfson & Leung, 2020).

Despite a lack of nationwide data, a survey of more than 100,000 students at 202 colleges by Goldrick-Rab et al. (2022) indicates that students' food security was disproportionally negatively affected by the pandemic, especially for students who were sick themselves (e.g., self-reported COVID-19 infection). A case study from a Texas university (Owens et al., 2020) found one–third of the students self-reporting food insecurity. However, during the lockdown phase a significant share of Iowa State University students was less likely to experience food insecurity as they returned to live with their parents rather than on campus (Davitt et al., 2021). A case study from a large public university in the Southeastern U.S. reiterates the ambiguous patterns of student food security in Spring 2020: While food security improved for 12% of students, at the same time it worsened for another 20% (Soldavini et al., 2020). This is similar to findings from Kim-Mozeleski et al. (2023), albeit not specifically targeting university student populations, in which one–third of the study population experienced their food insecurity either persisting (15%), improving (16%), or worsening (5%) as a consequence of the pandemic.

Montana was severely impacted by the pandemic, with disruptions of supply chains and retail food as well as elevated food insecurity (Byker Shanks et al., 2022; Ebel et al., 2022; Ebel & Byker-Shanks, 2022; John-Henderson et al., 2022; Wolfson & Leung, 2020). The implementation of governmental mitigation measures, such as lockdown policies, in response to the COVID-19 pandemic had significant and unprecedented impacts on Montana's food systems (Chiwona-Karltun et al., 2021).

Applied Research Methods

Study Site

Montana State University (MSU) is a land-grant university established in 1893 in Bozeman. During the 2020 fall semester, when the study was conducted, the main campus had 16,249 enrolled students, 46% of whom designated Montana as their home state. MSU is characterized by a large undergraduate student population (88% of all students in fall 2020) with 80% of students 18 to 24 years old. In fall 2020, 77% of students enrolled were full-time (Montana State University, 2023a). The MSU Bozeman campus has two dining halls,

at least one of which is open throughout the year. The student capacity for MSU housing facilities was around 4,200 in 2020, and students living in MSU housing facilities were able to obtain discounts using the dining halls (Montana State University, 2023b).

Data Collection

A structured survey (see Appendix) was developed by the research team at MSU, including experts in the areas of food environments, food security, and sustainable food systems, and based on existing survey instruments (Ahmed et al., 2020). Before administering the survey, approval of obtaining human subjects to participate was obtained by the Institutional Review Board (IRB) at MSU (IRB Number: SA071320-EX). Informed consent was retrieved from all participants, following IRB guidelines, prior to taking the survey. The survey was disseminated as an online link to student email accounts using Qualtrics (SAP, Provo, UT) to a random sample of 2000 MSU students (about 12% of the student population) during the fall semester 2020.

Survey Instrument

The survey instrument included twenty questions grouped into three sections that solicited information on student (1) demographics, (2) food security and food environments in general, including a question eliciting participants to rank several ideas for enhancing food security on campus, and (3) effects of the COVID-19 pandemic on food access, availability, and security. Gender was not included in the survey questionnaire since our analysis focused on highlighting differences and/or similarities between housing situation and education level. The survey was pilot-tested with a group of students for field validity and refined based on user feedback in early fall 2020. The instrument consisted of 19 multiple-choice questions and one ranking activity. To measure participant food insecurity, two questions were included in the survey instrument using a two-question adaptation of the U.S. Adult Food Security Survey Module Six-Item Short Form (Gundersen et al., 2017; USDA ERS, 2012): (1) "I/we worried whether my/our food would run out before I/we got money to buy more"; (2) "The food that I/we bought just didn't last, and I/we didn't have money to get more." If a respondent answered "sometimes true" or "often true" to either question, they were classified as food insecure.

Data Analysis

Using STATA (StataCorp, College Station, TX), the survey was processed for descriptive statistics. Margins of error were calculated for a 95% confidence level. For multi-response questions, we determined a weighted sample proportion that used core demographic variables (age, race and ethnicity, student degree level, housing situation) to generate strata. The weighted sample proportion considers the different proportions of respondents in each stratum in order to provide a more accurate representation of the overall population (Pfeffermann et al., 1998). In addition, we examined individual probability of food insecurity based on both housing situation and degree level, using a logit-linear relationship to evaluate both factors and their contributions to the estimated probability (Stroud, 1994).

$$Food\ insecurity \sim \text{Bernoulli}(\pi_i)$$

$$\pi_i = \frac{e^{(\hat{\beta}0 + \hat{\beta}1 * \text{hou} + \hat{\beta}2 * \text{lev} + \hat{\beta}3 * \text{hou} * \text{lev})}}{1 + e^{(\hat{\beta}0 + \hat{\beta}1 * \text{hou} + \hat{\beta}2 * \text{lev} + \hat{\beta}3 * \text{hou} * \text{lev})}}$$

where *hou* represents housing situation (on/off campus) and *lev* represents student educational level (graduate/undergraduate).

Sample

A total of 443 responses were validated (21% response rate) but only 391 individuals responded to all survey questions. Table 1 summarizes the most significant sample demographics.

Findings

Food (In)security

Approximately one-third of student participants reported food insecurity (34%). For students living on campus, the share of food-insecure individuals was lower for undergraduate than for graduate students. Conversely, off-campus, undergraduate

Table 1. Core Sample Demographics and Overall Montana State University Student Population Indicators for 2020

Sample demographics parameter	Sample demographics numbers	Montana State University Enrollment Fall 2020
Population	443	16,249
Age	18–24 years (82%); 25–29 years (9%); 30–39 years (5%); 40+ years (4%)	18–24 years (80 %); 25–29 years (10%); 30–39 years (6%); 40+ years (3%)
Ethnicity / race	White (89%); Asian (4%); American Indian or Alaska Native (4%); Black (2%); Hawaiian or Pacific Islander (1%); Hispanic or Latino (8%)	White (93%); Asian (4%); American Indian or Alaska Native (5%); Black (1%); Hawaiian or Pacific Islander (1%); Hispanic or Latino (5%)
On-campus students	32% (68% off-campus)	28% (72% off-campus)
Full-time students	77% (23% half-time)	77% (23% half-time)
Undergraduate students	88% (12% graduate)	88% (12% graduate)

Source: Montana State University, 2020

students were more food insecure than graduate students (Figure 1). We found that both housing and education levels equally contribute to the students' food insecurity ($p = 0.01$).

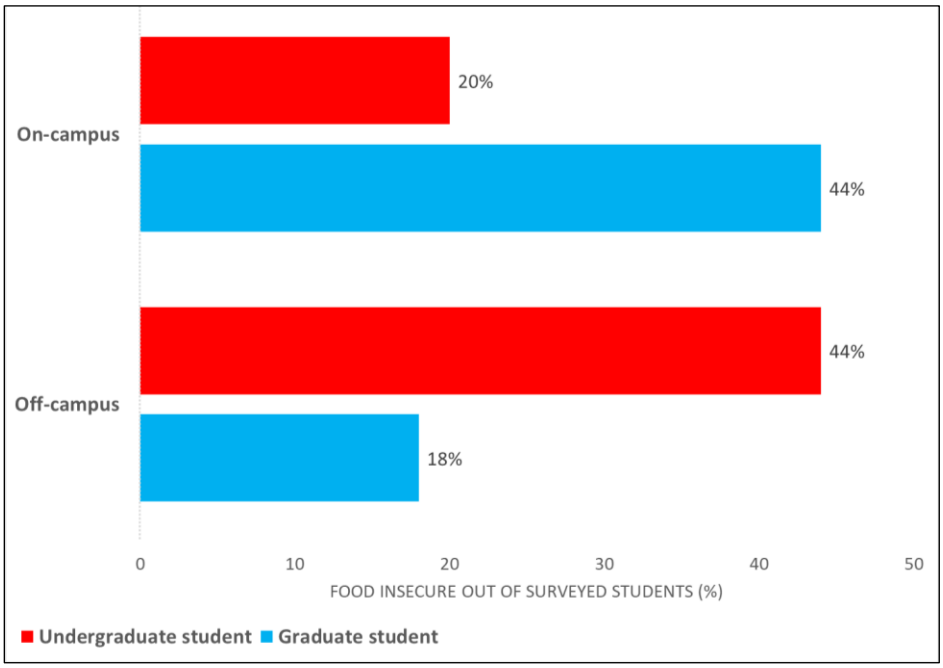
Types of Food Environments

Students responded to the question as to where they regularly obtained their food that they accessed food from diverse types of built food environments, with grocery stores the most prevalent (90% of respondents) and restaurants (67%) (Table 2). Several individuals also procured food from wild food environments (15%), specifically through hunting, fishing, and foraging. Eight percent of students grew food in their home gardens. Students prepared most of their meals at home or in their dorms, compared to campus dining halls or locations off-campus (Figure 2).

Food Access and Environments

Approximately one–third of participants (32%) shared that while being a student they had experienced a lack of access to adequate food. Students were also asked about specific attributes (which were not further explained in the questionnaire) of the food to which they had access. Most students claimed to have access to food that is affordable

Figure 1. Reported Food Insecurity Based on Students' Housing Situation and Degree Program Level: Percentage of Food Insecure Students out of Valid Responses (*n* = 437; margin of error: ±1.6%)



(93%), while access to sustainable food was mentioned less frequently (66%) (Figure 3).

Furthermore, the participants provided feedback regarding their access to resources promoting food security (Figure 4): A significant proportion of student respondents (90%) reported adequate access to transportation for purchasing and gathering food. Nearly 90% also considered themselves equipped with cooking skills and knowledge of healthy diets.

A narrow third of the participants (32%) responded that they had experienced a lack of adequate food access while being a student. For this subset of students, the most prominent negative

Table 2. Food Environments where Students Regularly Access Food, Multiple Responses Possible, Weighted Percentage of Valid Responses (*n* = 443; margin of error: ±1.5%)

Food Environment	Weighted Sample Proportion
Grocery store	90%
Restaurants	67%
Campus dining halls	37%
Coffee shops / café	36%
Convenience stores	17%
Wild food environments	15%
Home garden	8%
Farmers market and/or campus farm stand	7%
Farm share or community supported agriculture share	3%
Foodbank and/or food pantry	3%
Other	3%

Figure 2. Locations Where Students Regularly Consume their Meals, Weighted Percentage of Valid Responses (*n* = 439; margin of error: ±1.5%)

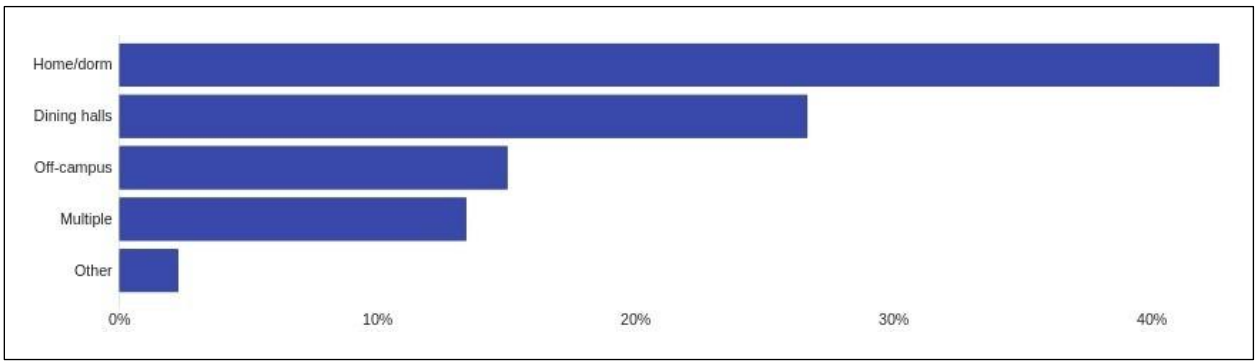


Figure 3. Student Access to Healthy Food (Student Perceptions of their Food Environments Based on Adapted Key Food Environment Elements), Weighted Percentage of Valid Responses (*n* = 432; margin of error: ±1.5%)

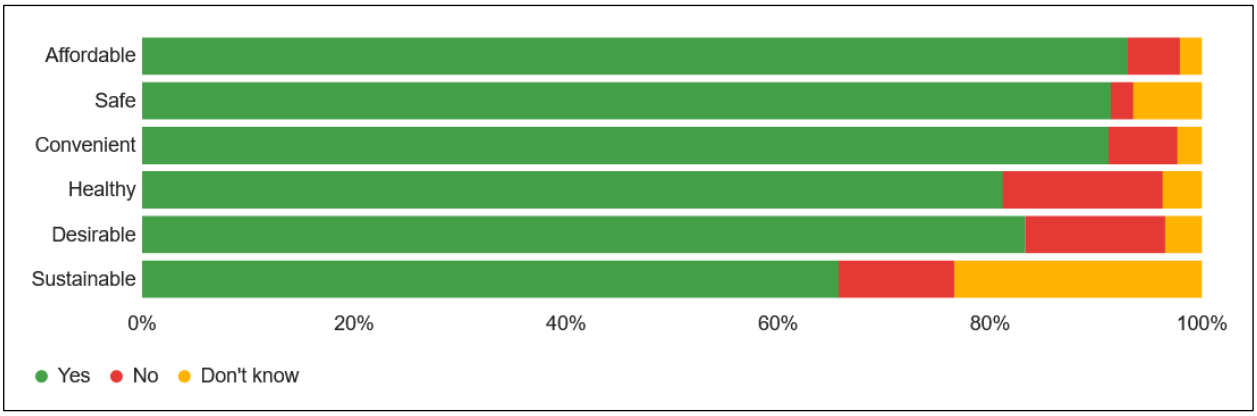
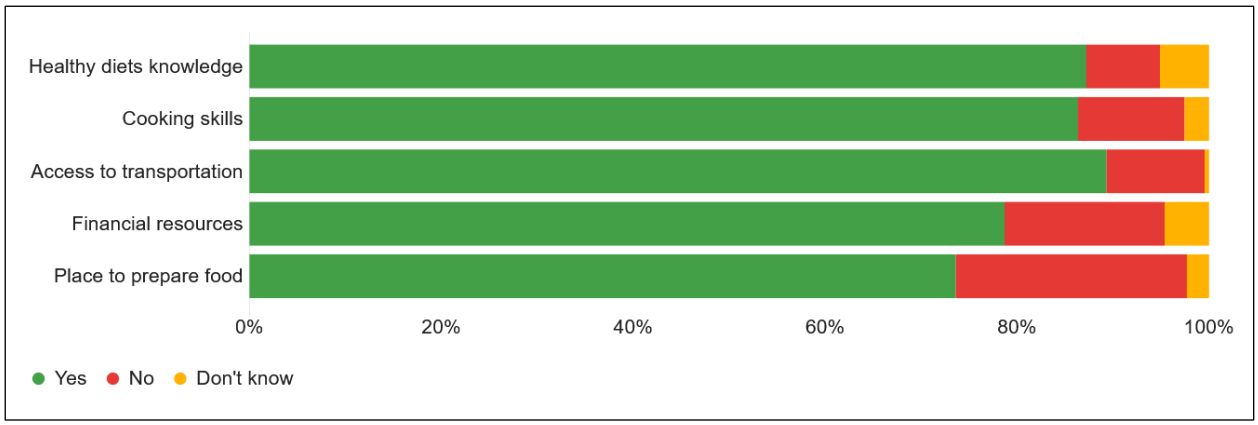


Figure 4. Individual Skills and Access to Resources to Support Students' Diet, Weighted Percentage of Valid Responses (*n* = 431; margin of error: ±1.5%)



impact of this circumstance was on dietary quality (83%) followed by impacts on their physical (63%) and mental (62%) health, as well as on their overall wellbeing (64%) (Figure 5).

Impact of the Pandemic

This section examines the impact of the early stage of the COVID-19 pandemic (year 2020) and related regulatory measures on students' food access and security. While over half of the students (55%) perceived no significant effect on their food access, 44% reported experiencing a worsened situation. Students residing off-campus faced slightly greater challenges (Table 3). Our findings highlight, in addition, that the participants encountered trade-offs between allocating funds for food and meeting various other expenses essential for their livelihoods and educational pursuits, including housing and educational expenses (Table 4).

Figure 5. Attributes Perceived to be Affected by Lack of Access to Adequate Food While Being a Student (Only Students who Reported Lack of Access to Adequate Food), Weighted Percentage of Valid Responses (*n* = 128; margin of error: ±2.8%)

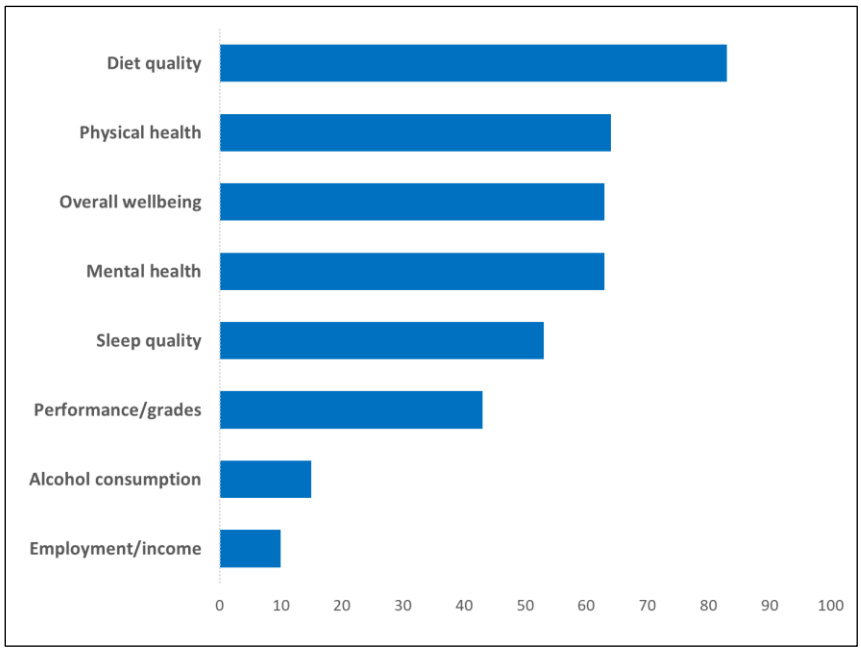


Table 3. Impact of COVID-19 on the Facility of Food Access, Conditional On/Off Campus Housing, Percentage of Valid Responses (*n* = 425; margin of error: ±1.5%)

Housing location	About the same as before	Easier	Harder
On campus	59%	1%	40%
Off-campus	52%	1%	47%

Students further reported how COVID-19 impacted features of their lifestyle. Of note, the students living off campus perceived a greater impact on their lifestyle than those residing in student housing (Figure 6). They reported in our survey that before the pandemic they were highly engaged in a range of food-related practices and recreational activities, and that most were severely affected by COVID-19 (Figure 7).

Recommendations for Enhancing Food Access

Ideas we presented for enhancing food access on campus were perceived positively by most survey respondents. The idea to develop a program to "swipe" meals at campus dining halls, from advantaged students with an abundant meal plan to students in need of a meal, was especially popular (Figure 8).

Table 4. Expenses Affecting Students' Food Budget (Single Choice Question), Weighted Percentage of Valid Responses (*n* = 125, only students who reported lack of access to adequate food; margin of error: ±2.8%)

Attribute	Weighted Sample Proportion
Housing	16%
Educational expenses	14%
Transportation	13%
Household utilities	12%
Medical care or medical expenses	7%
Debts and other expenses	15%

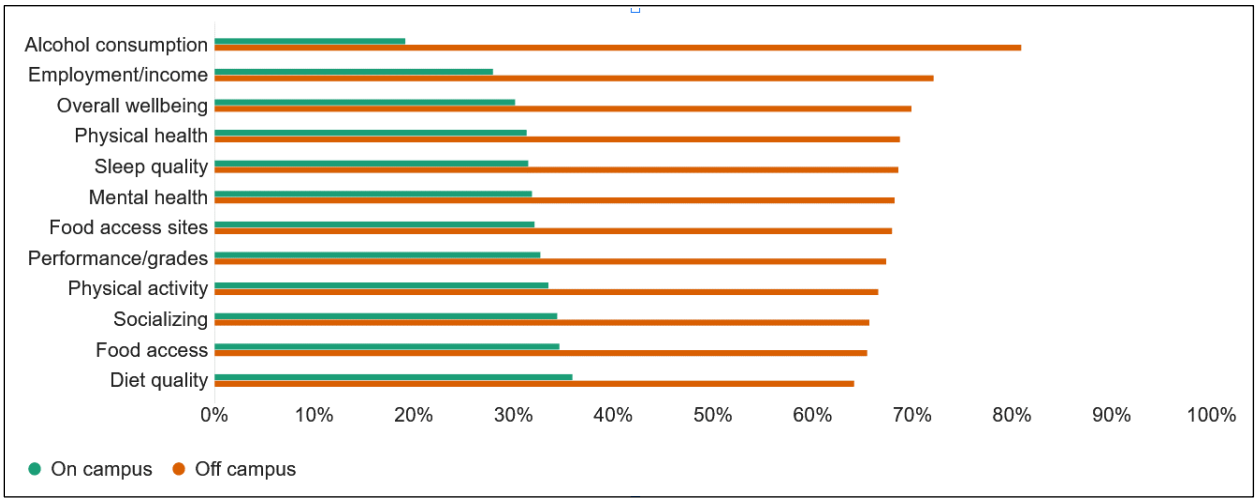
Discussion

Food (In)security

Although food insecurity is a pressing issue among U.S. college students, limited research has focused on the topic (Berry, 2020; Willis, 2021). Contrary to the perception of a protected college environment, studies indicate that students are particularly vulnerable to food insecurity, with higher rates in colleges and universities compared to the general population (Nazmi et al., 2019; Willis, 2021). With over 20 million individuals in higher education, addressing student food security is a growing public health concern (Nazmi et al., 2019). Economic stressors, such as rising college costs and increasing enrollment of low-income and first-generation students, contribute to food insecurity among this population (Greaney et al., 2009; Kolowich, 2015).

Existing research on college student food insecurity has primarily focused on demographic and economic aspects, with limited attention given to other risk factors such as place of residence and specific food environ-

Figure 6. Features Perceived to be Affected by the COVID-19 Pandemic by Housing Situation, Weighted Percentage of Valid Responses (n = 420; margin of error: ±1.5%)



Note: our questionnaire asked for lifestyle changes, not exclusively for the negative impacts of the pandemic.

ments (Bruening et al., 2016; Martinez et al., 2018). Furthermore, most studies were conducted before the COVID-19 pandemic further disrupted food security (Boyacı-Gündüz et al., 2021; Rogers et al., 2021). To address this research gap, our study at Montana State University comprehensively

Figure 7. Food-Related Behavior and Practices of Surveyed Students Prior to and Since the Onset of the COVID-19 Pandemic, Weighted Percentage of Valid Responses (*n* = 407; margin of error: ±1.6%)

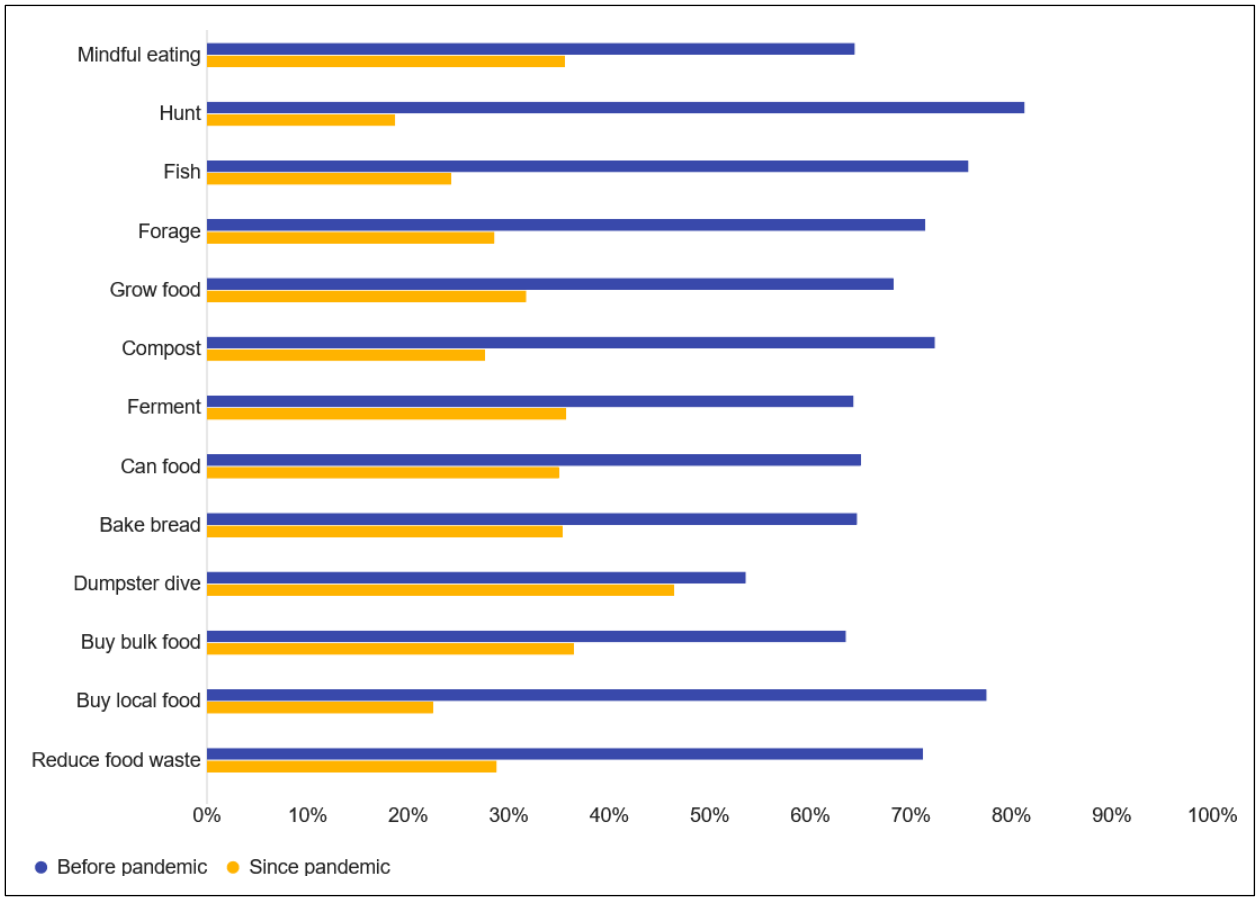
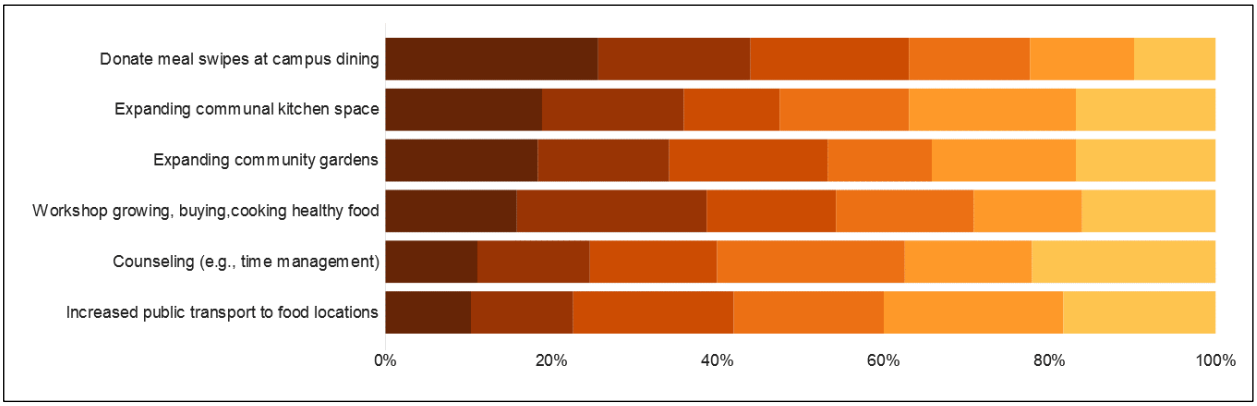


Figure 8. Heatmap of Ranking of Student-Generated Ideas for Enhancing Food Access on Campus (Dark Red =Indicates Ideas Perceived Most Beneficial, Yellow = Ideas Perceived Least Beneficial), Percentage of Valid Responses (*n* = 396; margin of error: ±1.6%)



assessed risk factors for student food insecurity by considering both graduate and undergraduate students, their living arrangements, and the impact of the early stage of the COVID-19 pandemic. The results showed that 34% of surveyed MSU students experienced food insecurity, aligning with the range found in similar previous studies (Chaparro, 2007; Freudenberg et al., 2011; Gaines et al., 2014; Patton-López et al., 2014; Kolowich, 2015; Morris et al., 2016; Payne-Sturges et al., 2017; Martinez et al., 2018; Willis, 2021).

Most food security research deals with adults, adolescents, and school children. Accordingly, low food security has been shown to affect student academic achievement, attention, health, wellness, and behavior (Cady, 2014; Howard, 2011; Jyoti et al., 2005). What is known for the college level is that food-insecure students sacrifice food for educational expenses, are unlikely to regularly eat breakfast and homecooked meals, tend to have unhealthy eating habits in general, face higher odds of depression and other mental health issues, and are more susceptible to alcohol abuse compared to their food-secure peers (Bruening et al., 2016; Cady, 2014; Martinez et al., 2018). Correspondingly, food-insecure MSU students claimed that limited access to healthy food had a negative impact on their overall well-being and their physical and mental health.

In addition, our study explored the association between food insecurity and students' place of residence. We found that undergraduate students living off-campus had a higher prevalence of food insecurity (40%) than those living on campus (20%), consistent with previous findings (Martinez et al., 2018). This discrepancy may be influenced by the prevalence of pre-paid meal plans among undergraduate students in campus dining halls. This is supported by a study that contrasted food insecurity between undergraduates in on- and off-campus living situations; a higher proportion of students participating in a meal plan resided on-campus compared to those residing off-campus (El Zein et al., 2019). Glantsman et al. (2022) also found that students who lived on campus before the pandemic were significantly less likely to be at risk of food insecurity during the pandemic compared to students who lived off campus before the pandemic. In contrast to MSU undergraduates, graduate students living on-campus faced higher food insecurity (44%) than those living off-campus (18%). While this requires further investigation, this phenomenon may be related to a tight housing market and expensive rental costs in Bozeman that force several students to share apartments, potentially decreasing food expenses. Future research efforts should explore the relationship between food insecurity and living on- and off-campus, paired with social determinants of health as well as the local circumstances.

Food Access and Environments

Many U.S. students purchase inexpensive foods of poor nutritional quality, not only because of financial limitations but also due to limited access to both affordable quality food markets and facilities for storing and preparing foods (Martinez et al., 2018). At MSU, most food-insecure and food-secure students reported getting food from a grocery store or supermarket (90% of surveyed students), restaurants (67%), the campus dining halls (37%), and coffee shops or cafés (36%). Compared to a 2018 study at different University of California campuses (undergraduate students only), MSU students buy food more frequently in grocery stores and restaurants but less at university facilities such as dining halls (Martinez et al., 2018). While dining halls at MSU were operational during fall 2020, ongoing challenges with staff shortages or students' potential health concerns may have affected the desirability of utilizing the dining halls during this period.

Over 90% of MSU students stated that they had access to affordable, safe, and convenient food. In addition, over 75% claimed to have knowledge of healthy diets and cooking as well as a place to prepare food. Nevertheless, a third of students reported being food insecure. We conclude that access to food in a college town like Bozeman does not seem to be the most limiting factor for student food security, nor food preparation knowledge or cooking infrastructure at home. Hence, other factors rather than food access must contribute to the students' food insecurity. These factors may involve excessive expenses for other needs such as tuition and housing that absorb money in

an expensive place like Bozeman, and a college agenda that does not leave students much time to purchase and prepare their food. Further research is crucial to understand the underlying reasons for the paradoxical situation that a considerable segment of college students experiences food insecurity despite seemingly accessible food options. It is essential to dig deeper into the specific factors contributing to this issue.

In our study, we discovered that 43% of MSU students identified inadequate access to food as negatively affecting their academic performance. This highlights the severity of the problem and emphasizes the urgent need for targeted interventions and support systems to address student food insecurity and its impact on educational outcomes. MSU students demand creative and inexpensive solutions to improve the food access of a significant part of their population. A program allowing students with a meal plan to "swipe" their meals at campus dining halls and redirect them to students in need of a meal was assessed especially positively in our survey. Organizations such as Swipe Out Hunger, which has served over two million meals in the U.S. and Canada with its "Swipe Drives" and campus pantries (Swipe Out Hunger, 2023), have already impacted numerous students. Other well-regarded strategies to address the unique food security needs of students include communal kitchen space, community gardens, and workshops.

Impact of the Pandemic

During the lockdown phase in Montana and the following months of 2020, 55% of MSU students perceived no effect of the COVID-19 pandemic on their food access, while 44% suffered from more limited access than before the pandemic. These numbers are slightly below those of the overall U.S. population during the first months of the pandemic (Niles et al., 2020). The MSU data shows that despite a campus infrastructure providing students with appropriate food access during the pandemic, 44% of students living off-campus (which made up for two thirds of our sample) faced limited food access during the survey period. Among the students facing limited food access, a considerable 67% reported experiencing challenges in their academic activities.

Separating the specific impact of limited food access on academic performance from other factors proves challenging. The pandemic-induced isolation, which affected most students whether on- or off-campus, certainly had a profound influence on their overall well-being, subsequently leading to negative consequences for academic performance. Our study findings demonstrate that 81% of students experienced social isolation, 71% encountered mental health issues, 60% reduced physical activity, and 45% a decline in sleep quality. These four factors often co-occur with food insecurity and may exacerbate it. Strategies utilizing university and governmental resources to support student mental health and physical activity, and promote financial assistance, food aid, and access to health information are essential to increase the resilience of this vulnerable population to a shock like COVID-19.

Conclusions

Food insecurity among U.S. college students is a significant and growing concern. Despite the common perception that students live in a protected environment, research shows that food insecurity among students is higher than for the overall population. Food insecurity among college students has far-reaching implications, affecting academic achievement, attention, health, wellness, and behavior. Notably, the transition to college often comes with economic stressors, such as the rising costs of education. College students are facing the challenge of balancing educational expenses with basic needs like food, and many are unaware of how and where to find support.

Previous research on college student food insecurity has primarily focused on demographic and economic factors, with limited attention given to other risk factors such as place of residence or specific food environments. Most studies were conducted before the COVID-19 pandemic, which has further disrupted food security. In our study at MSU, we aimed to comprehensively assess the risk factors for student food insecurity, considering graduate and undergraduate students, their place of living, food access, and food environment. Our findings reveal that 34% of surveyed MSU students reported being food insecure, which aligns with

studies at other higher education institutions over the past decades. Our study confirmed that food-insecure students at MSU faced challenges in maintaining a healthy diet, experienced negative impacts on overall well-being, and reported lower academic performance. Moreover, our assessment of the relationship between food insecurity and students' food environments highlighted that off-campus undergraduate students experienced higher food insecurity rates than those living on campus. Remarkably, on-campus graduate students faced higher food insecurity than their off-campus peers. Further research is needed to understand the underlying reasons for these discrepancies. Access to affordable, safe, and convenient food was not the only factor limiting student food security at MSU. Other factors, such as housing situation and housing expenses, seem to be equally significant. Since our study was conducted in 2020, we have also examined the impact of the COVID-19 pandemic on student food security, food access, and food-related practices. We found that the pandemic influenced food habits, resulting in changes in student purchasing and preparation behaviors.

Addressing college student food insecurity requires comprehensive strategies that go beyond providing access to affordable food. It necessitates comprehending the underlying economic challenges, raising awareness about available resources, and implementing supportive policies and interventions on college campuses. Future research should explore the unique circumstances contributing to food insecurity among college students and evaluate the effectiveness of interventions to mitigate this problem. Addressing food insecurity among college students is crucial for their overall well-being, academic success, and the promotion of a healthier society. By recognizing the unique challenges faced by this population and implementing targeted interventions, we can work toward creating a supportive environment that ensures all students have access to nutritious and affordable food throughout their college years.

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Appendix: Survey Questionnaire

Part 1: Student Profile
This part of the survey will ask you three questions regarding your degree program, housing, and enrollment.

1. What type of degree program are you in?
    a. Undergraduate
    b. Masters
    c. Doctoral

2. Do you live on or off campus?
    a. On campus
    b. Off campus

3. Are you a full-time or part-time student?
    a. Full-time student
    b. Part-time student

Part 2: Food Access
This part of the survey will ask you five questions regarding food access including where you get your food from and food resources.

4. Where are all the places where you get food?
    a. Campus dining halls
    b. Campus farm stand
    c. Coffee shop / cafe
    d. Farm share / Community Supported Agriculture (CSA)
    e. Farmers market
    f. Food bank and / or food pantry
    g. Gas station
    h. Grocery store
    i. Home garden
    j. Restaurants
    k. Wild foods environments (places for fishing, hunting, foraging)
    l. Other (please specify)

5. **Where do you mostly get your meals?** (Select the one that best describes you)
    a. I mostly get food from the dining halls
    b. I mostly prepare food in my dorm or at home
    c. I mostly purchase food from off campus
    d. I tend to get food from multiple sources
    Other (please specify)
6. Please select how often the following statements were true for you/your household in the past 12 months. (answer options include never true, sometimes true, often true)
    a. "I/we worried whether my/our food would run out before I/we got money to buy more."
    b. "The food that I/we bought just didn't last, and I/we didn't have money to get more."

7. Do you have adequate access to foods with the following attributes? (yes, no, do not know)
    a. Affordable food
    b. Desirable food that meets preferences
    c. Food that is convenient to prepare and consume
    d. Healthy food
    e. Safe food
    f. Sustainable food
8. Do you have adequate access to the following resources to support your diet?

(answer options: yes, no, do not know)
   a. Cooking skills and knowledge
   b. Financial resources
   c. Knowledge of healthy diets
   d. Place to cook / prepare food
   e. Transportation

Part 3: Challenges and Opportunities
This part of the survey will ask 6 questions regarding challenges and opportunities pertaining to food access while you have been a student at MSU or Gallatin College.

9. If you have experienced a lack of access to adequate food while you have been a student, do you think it has impacted any of the following? (select all that apply)
   a. I have not experienced a lack of access to adequate food while being a student
   b. Grades
   c. Mental health (e.g., anxiety, depression, preexisting trauma, OCD, etc.)
   d. Overall academic performance
   e. Overall wellbeing
   f. Physical health

10. In the last 12 months, did you ever have to choose between paying for any of the following expenses versus paying for food? (select all that apply)
   a. Educational expenses
   b. Housing
   c. Household utilities
   d. Medical care or medical expenses
   e. Transportation
   f. Other debts or expenses

11. Do you find it easier, harder, or about the same as before the COVID-19 pandemic to get food overall?
   a. About the same as before
   b. Easier
   c. Harder

12. Did the COVID-19 pandemic impact any of the following? (select all that apply)
   a. Academic performance / Grades
   b. Alcohol consumption
   c. Diet
   d. Employment
   e. Food access
   f. Household income
   g. Mental health (e.g., anxiety, depression, preexisting trauma, OCD, etc.)
   h. Overall lifestyle
   i. Overall wellbeing
   j. Physical activity
   k. Physical health
   l. Places where you get food
   m. Sleep quality
   n. Socializing

13. Do you carry out any of the following food practices? (select all that apply)
    a. Baking bread
    b. Buying in food in bulk
    c. Buying local food
    d. Canning
    e. Composting
    f. Cooking
    g. Cooking meals together with friends and / or family
    h. Dumpster diving
    i. Fermenting
    j. Fishing
    k. Foraging
    l. Gardening
    m. Gleaning
    n. Growing food
    o. Hunting
    p. Keeping a sourdough starter
    q. Mindful eating
    r. Sharing recipes with friends and/or family
    s. Trying to reduce food waste

14. Below are some student-generated ideas for enhancing food access on campus. Which ideas do you think would be the most beneficial to implement? Please drag and drop the statements below to rate them from most beneficial (1) to least beneficial (9).
    a. Community garden space for growing food
    b. Cooking workshop on preparing affordable meals
    c. Counseling on managing personal finances
    d. Guidance on applying for nutrition assistance programs
    e. Increased public transportation access to food locations
    f. Kitchen spaces
    g. Program where students can donate meal swipes at campus dining halls
    h. Workshop on growing food
    i. Workshop on basics of a healthy diet

Part 4: Demographic Information
The last part of the survey will ask five demographic questions regarding your background.

15. How old are you?
    a. 18–24 years
    b. 25–29 years
    c. 30–39 years
    d. 40 or older

16. What racial background and ethnicity do you identify as? (Check all that apply, ordered alphabetically below)
    a. American Indian or Alaska Native (Tribal affiliation:_____)
    b. Asian
    c. Black or African American
    d. Hispanic or Latino
    e. Native Hawaiian or Pacific Islander
    f. White
    g. Other
    h. Prefer not to answer

17. Do you care for a dependent(s)?
    a. No
    b. Yes

18. Do you (or your dependents) receive any form of nutrition assistance?
    Examples of nutrition assistance include food pantry, Food Distribution Program on (American) Indian Reservations (FDPIR), Supplemental Nutrition Assistance Program (SNAP), Summer Lunch Program
    a. No
    b. Yes

19. Are you receiving care for any of the following health factors?
    a. Autoimmune disease(s)
    b. Chronic lung condition (e.g., asthma, Chronic obstructive pulmonary disease, etc.)
    c. Diabetes (type 1 or type 2)
    d. Heart disease (e.g., coronary heart disease, congestive heart failure, hypertension, etc.)
    e. Liver disease (including hepatitis B or C)
    f. Mental health conditions (e.g., anxiety, depression, preexisting trauma, OCD, etc.)
    g. Obesity
    h. None of the above

Do you have any additional comments you wish to share on food access for students?

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Food insecurity in Yukon communities during COVID-19: A qualitative study

Sara McPhee-Knowles [a] *
Yukon University and University of Saskatchewan

David Gatensby [b]
Yukon University

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Abstract

Food insecurity increased in Canada during the COVID-19 pandemic; in the Yukon Territory, the Whitehorse Food Bank saw its scope increase significantly as smaller Yukon communities were requesting deliveries of food while travel restrictions were in place. In this qualitative study, the researchers conducted semi-structured interviews with food bank clients in Whitehorse and two smaller Yukon communities, as well as representatives of other organizations that were involved in community food security initiatives. The results revealed five main themes emerging from shared client experiences and impacts from the pandemic: emphasis on the hamper as core food on an ongoing basis, the importance of traditional foods, food insecurity and access, the role of the Whitehorse Food Bank in supporting informal networks in communities, and ideal food situations that focused on an abundance of fresh and land-based foods. The results show some contrast between needs in Whitehorse and needs in smaller, more remote Yukon communities. Because of limited access to fresh foods in communities outside

[a] * *Corresponding author*: Sara McPhee-Knowles, PhD, Assistant Professor, School of Business and Leadership, Yukon University; 500 University Drive, Box 2799; Whitehorse, Yukon, Y1A 5K4 Canada; smcpheeknowles@yukonu.ca; and Adjunct Professor, Johnson-Shoyama Graduate School of Public Policy, University of Saskatchewan; 101 Diefenbaker Place; Saskatoon, SK, S7N 5B8 Canada.

[b] David Gatensby, Bachelor of Business Administration Student, School of Business and Leadership, Yukon University; Whitehorse, Yukon, Canada.

Author Note

Sara McPhee-Knowles is a board member of the Whitehorse Food Bank. This work was presented publicly at the Stockholm Resilience Centre in February 2023 and in Whitehorse in March 2023. A version of this paper was written up as a report to the Whitehorse Food Bank and distributed to participants.

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of Whitehorse, merely increasing income supports would not completely alleviate food insecurity for these participants, who they lack physical access as well as economic access to fresh, preferred foods.

Keywords
food insecurity, Northern Canada, Yukon, food bank, COVID-19, pandemic response, remote communities

Introduction

Food security means that individuals have consistent "physical, social and economic access" to safe food in adequate amounts to meet their preferences and needs (Wakefield et al., 2015); food secure people can access sufficient amounts and types of food to meet their dietary and cultural needs in a way they prefer. The definition used to measure food insecurity in Canada is "inadequate or insecure access to food due to financial constraints" (Tarasuk & Mitchell, 2020, p. 5). In Canadian northern communities, however, food security is often intimately tied to the land, and is affected by accessibility as well as finances. Food builds community and connection "through shared meals and feasts, connects people to the land through traditional food gathering practices, and inter-connects [*sic*] the people, the land and the culture" (Stroink & Nelson, 2012, p. 66). Thus, the toll of food insecurity is punctuated by other determinants involving connectivity, including geography, climate, remoteness, proximity to food production, access to culturally relevant foods, and levels of social inclusion. Food insecurity has long been a concern in Canada's North; the most recent figures available show that in 2020, 15.3% of households in the Yukon, 23.1% of households in the Northwest Territories, and 46.1% of households in Nunavut are moderately or severely food insecure (Tarasuk et al., 2022).

The Yukon Territory is located in the far northwest of Canada, bordering Alaska, USA to the west, the Northwest Territories to the east, and British Columbia to the south. The territory is vast and remote, and is home to about 44,000 residents, of whom about 80% live in the capital city of Whitehorse (Yukon Bureau of Statistics, 2023). The rest live in smaller communities throughout the territory, often separated by large distances (Figure 1). The next largest community, Dawson City, 533 km northwest of Whitehorse, is home to about 2300 people, and the third largest community is Watson Lake, 437 km south-east of Whitehorse, with about 1500 residents (Yukon Bureau of Statistics, 2023). Most of the smaller communities are home to about 200–900 residents, and not all have a grocery store. There is economic disparity between Whitehorse and the smaller towns; median income in Whitehorse is higher (Statistics Canada, 2023), and goods tend to cost more in the smaller, more remote communities (Yukon Bureau of Statistics, n.d.). Because Whitehorse is home to such a large proportion of the population, Yukon-level statistics are skewed by the conditions of the capital city.

All communities have year-round road access except Old Crow, which is only accessible by air. The territory has cold, dark winters and short, intense summers, with about 80 frost-free days near Whitehorse (Environment and Climate Change Canada, 2013). Of the 14 Yukon First Nations, 11 are self-governing under modern treaties. Around 21% of the population is of First Nations ancestry: 56% of the Yukon First Nations people live in Whitehorse, 15% of its population, and the remaining 44% live in the smaller communities, where the percentage of First Nations people ranges from 89% in Pelly Crossing to less than 25% in Dawson City (Graham et al., 2021). Food insecurity in Canada is racialized (Budd Nugent et al., 2022); Indigenous people experience higher rates of food insecurity in the ten provinces (Tarasuk et al., 2022). With the racialized nature of food insecurity, and as the Yukon Indigenous population is larger than the Canadian average, we can expect higher than average rates of food insecurity.

Food banks began as a community response to food needs during the 1980s in the context of economic recession and neoliberal reductions in social safety nets. Since then, they have become institutionalized, as there has not been a strong Canadian policy response to food insecurity (Loopstra & Tarasuk, 2012; Riches, 2011). Only 21.1% of food insecure households in Canada access food banks; these families appear to have lower incomes generally, and are thus more likely to seek assistance

Figure 1. Map of the Yukon Territory

Source: Wikimedia Commons, 2012

from community agencies or social assistance than the food insecure households that do not access food banks (Tarasuk et al., 2019).

The Whitehorse Food Bank[1] began operating in the Yukon in 2009 and primarily served Whitehorse residents, although Yukoners from other communities who happened to be in Whitehorse on a distribution day were able to pick up a hamper, which in this context is emergency food assistance, tailored to household size, that includes core staples of canned and dry goods and some fresh or frozen foods depending on availability. The Whitehorse Food Bank has seen its scope expand significantly since the COVID-19 pandemic began in March 2020. Across Canada, food bank use has increased 35% from 2019 (Food Banks Canada, 2022); in the Yukon, hamper distributions increased 38% from 2021 to 2022 (Food Bank Society of the Yukon, 2022). Prior to COVID-19, all clients seeking emergency food assistance were required to come into the Food Bank in Whitehorse to receive five to seven days of emergency food once per month; however, in the early days of the pandemic, Yukoners were encouraged to limit travel between the smaller communities and Whitehorse. In response, communities requested that the Whitehorse Food Bank distribute hampers more broadly. With the factors of high inflation and transportation costs, as well as increased food insecurity, the Whitehorse Food Bank has seen increased demand and operational costs at a time when the organization has begun to play a larger role connecting remote communities in the Yukon food system.

This study was motivated by the increased demands placed on the Whitehorse Food Bank and the sudden shift in operational scope due to the COVID-19 pandemic. Co-developed with the Whitehorse Food Bank, this project sought to collect information from clients in the new areas that were being served by the organization at an unprecedented time. Through qualitative interviews, the researchers sought to depict the experiences of food-insecure clients of the Whitehorse Food Bank in Whitehorse and in two smaller communities. The researchers also interviewed representatives of other organizations who were involved in community food security initiatives in some way. The results revealed shared client experiences and impacts from the pandemic that were specific to the unique Yukon experience of travel restrictions (McPhee-Knowles et al., 2022).

Research Methods

The purpose of the qualitative interviews was to obtain rich multifaceted insights from clients of the Whitehorse Food Bank with respect to their experiences with food insecurity throughout the COVID-19 pandemic. Participants were also asked about accessing Food Bank services in their communities. The semi-structured interview guide was developed by the researchers, who sought input from the executive director of the Whitehorse Food Bank as to the content of the questions. The project was approved by the Yukon University Research Ethics Board in April 2022. The two researchers completed interviews in Haines Junction, Watson Lake, Whitehorse, and Carmacks from June to August 2022. They also conducted six interviews with representatives from organizations involved in food security or distribution in some way in those four communities (these participants are sometimes referred to as non-client participants, for clarity). During distribution times, 17 clients were interviewed in Haines Junction, Watson Lake and Whitehorse. Unfortunately, due to forest fires and flooding that affected Carmacks during the study period, the research team was unable to complete interviews in that community as planned. All participants consented to the interview and were compensated for participating. The interviews were audio recorded following consent and were transcribed using NVivo Transcription. Transcripts were reviewed by the researchers for accuracy and edited as necessary. Identifying information was removed from the transcripts. Participants were offered the opportunity to request a transcript and quotes to review; these were sent to clients either through a password-protected link or by mail, depending on their contact information.

[1] The Whitehorse Food Bank has recently changed its name to the Food Bank Society of the Yukon to reflect the increased scope of its operations. For simplicity, the organization is referred to as the Whitehorse Food Bank throughout this paper.

The researchers followed a six-step approach to thematic analysis: 1) familiarization with the data set, 2) an open-ended coding process, 3) initial theme generation, 4) developing and reviewing themes against the data, 5) defining and naming final themes, 6) writing the report (Terry & Hayfield, 2021). Reviewing and editing the transcripts was an important part of building familiarity with the overall dataset.

Transcripts were coded using an inductive approach, rather than beginning with a predetermined codebook. One researcher coded in NVivo (Version 12) and the other reviewed paper transcripts and coded by hand. The client and non-client interviews were coded separately. Many of the same concepts came up in both types of interviews but were discussed from different perspectives. Following this initial coding effort, the two researchers compared their codes and discussed which codes should be added, which could be aggregated, and which would be candidates for promotion into themes. These discussions informed revisions to the initial coding in NVivo, and the lead author developed a smaller set of codes and recoded the data; this effort informed initial theme generation. Around this time, the researchers presented preliminary results to the board of the Whitehorse Food Bank for their feedback, which was helpful for refining the early prototype themes. The two researchers held subsequent meetings to review the initial themes against the data. Following further refinement, the themes were defined and the authors began drafting the analysis.

Limitations

There are some important limitations to this study. First, the results are context specific; we interviewed a limited number of participants, and the results are unlikely to be generalizable beyond the Yukon. We interviewed participants in a limited number of Yukon communities, and there may be regional perspectives that were not captured due to this approach. As well, we interviewed a small number of representatives from other organizations. All participants provided valuable insights, but these are based only on their own experiences. In addition, the experiences of those living with food insecurity but not accessing food bank services, which we know from other work are likely to be a large percentage of food insecure households, were not captured by the study criteria.

Results and Discussion

Food bank clients recounted a variety of experiences involving food insecurity and accessing the Whitehorse Food Bank in their community. Nearly every client we spoke with reported a difficult life event that led to them to needing to access the Food Bank, such as breaking up with a partner, health issues, losing their job, car accidents, and losing their driver's license. For example: "Then [I] split with my wife. … Things just kind of went downhill from there. So that's where I met the food bank." In some cases, clients described the impact of a difficult life event as compounded by being on a fixed income: "And ever since my husband passed, it's been [difficult], I'm really grateful for this. You know, like this [program] really helps me because I'm a pensioner."

Participants frequently reported skipping meals: "Yeah, I notice that I go without a lot of meals. I try not to say anything. I make sure that the people around me have their food before I eat. But that's been something I've done for more than 30 years though too, right." Another participant said: "I eat once a day. … It's when I am normally the hungriest. And you can't afford to shop here. Have you been in our grocery store? It's ridiculous!" Statistics Canada defines severely food insecure as disrupted eating patterns and reduced food intake (Polsky & Garriguet, 2022). Based on this definition, many of the clients we spoke with would be considered severely food insecure, but they often described themselves as getting by, or commented that they had always eaten every day, but only once per day. There is a stigma around admitting food insecurity, and some participants mentioned that they knew of others who would benefit from Food Bank services but were unwilling to go. Sometimes they would pick up food for others. Research indicates that many food insecure people do not access food bank support, in many cases by choice rather than because of barriers (Loopstra & Tarasuk, 2012). Food banks are an incomplete approach to addressing food insecurity;

there is a need for broader response from governments. Some groups, such as the Ontario Dietitians in Public Health, insist that food banks are counterproductive because they enable governments to avoid making food insecurity—and, in their view, addressing the root cause of inadequate income—a policy priority (Ontario Dietitians in Public Health, 2020).

Insecurity in food, housing, and transportation are all intertwined. Clients without vehicles or driver's licenses have more difficulty accessing food distributions, and people who are housing insecure may not have access to kitchen facilities for preparing food or temperature-appropriate food storage options. For example, one client remarked: "Well, there's only so much you cook in a hotel, right?" Another participant explained that a hamper that accounted for a lack of kitchen access would be appreciated: "Yeah, because anybody that's sleeping in a motel room, they should rearrange their box and realize. … That's not a kitchenette, it's just a room or a microwave." Yukoners frequently face increasingly high market rents (Yukon Bureau of Statistics, 2022) and utility costs, so their budgets for variable costs, including food, are squeezed: "You should be able to get food when you want food, but the money is going to the landlord, which is fine. That's a roof over your head." There is a relationship between increasing rents and food insecurity; previous research from the U.S. shows that a $500 increase in yearly rental costs results in a 10% relative increase in food insecurity (Fletcher et al., 2009).

The mental load of poverty was another theme across the interviews. Many participants were on fixed incomes, often social assistance, pensions, or employment insurance, and were struggling with increased costs due to inflation. Clients described the effort they undertake daily and weekly to just keep making it through: "Today that's why I have to come here, because I'm just running shy to make it for my next income. So like at times, I think to myself should I eat, should I cook or, you know, am I going to waste this food? Yeah, it's really a balancing act." This balancing act is taxing; it can involve budgeting money, rationing food, or conserving gas in a vehicle to ensure they can get to a Food Bank distribution on the required day. As noted by Mani et al. (2013): "The poor must manage sporadic income, juggle expenses and make difficult tradeoffs. … Preoccupations with pressing budgetary concerns leave fewer cognitive resources available to guide choice and action" (p. 976). A further element that contributes to the mental burden is managing daily activities around which support services are available. One participant said that they were waiting in their vehicle for the Food Bank to open, because they had a list of things to do in town involving several NGOs but there was confusion over schedules: "Well, to me, already this morning, I waited about an hour and a half just to get where I am. Yeah, for this place [other NGO] to open and I got a refusal or no confirmation. Or I'll call you back. So I sat and waited for this place [Whitehorse Food Bank] to open, you know, so I can catch the ten o'clock. Because two hours is not enough time for families to come in, you know, from 10 to 12, you know, because some people don't know that they only distribute for two hours a morning. You know, there's times that I've tried to come in an afternoon and go, oh no, it's closed. You've got to wait until the next day, the next week. Um, so you have to get out. You have to really keep your ball rolling, you know, if you need to get somewhere. And that's just how I see it. Yeah, you know, I made my trip to town worth it because now I'm going home with something." This is an example of tradeoffs that clients experience when trying to manage their day-to-day activities around accessing food supports.

Poverty also increases the risk of mental illness, both as a contributing factor due to stress from poverty, or as a consequence, when mental illness symptoms interfere with employment (Fell & Hewstone, 2015). Some clients described the impact of food insecurity on their mental health: "I'm always, seems like I'm always trying to stretch something somewhere, you know? It does, it gets to you after a while. I think that's why sometimes when I wake up, it's just like, I wish I could just go right back to bed." Participants also spoke about the positive mental health impact of a good meal: "Yeah, it fills you up and you're ready to go, you know, gives you your strength."

Participants overall had positive experiences

accessing the Food Bank. Most heard about the Food Bank's services through word of mouth. Overall, the participants spoke very highly of Food Bank staff and volunteers: "Very accommodating, very friendly. … That's what that's what I enjoy about being here. I feel I feel like they do like they're a part of, they make me a part of their family. It's like a family environment here." Some participants credited the program with keeping them from falling into even more severe food insecurity: "We're still trying to get on our feet. … I tell you what, the Food Bank for us was absolutely a god send. Cuz I don't think that we would have had many meals without that." Knowing that the Whitehorse Food Bank was there to rely on was described as alleviating the mental load associated with food insecurity: "I really appreciate the Food Bank being here. Especially, you know, when you're going through a hard time. It sure helps with that stress level at home, makes you breathe a little bit easier for another couple days."

Food preference was a common topic in the interviews. Participants, overall, expressed gratitude for the food they received through the program; some noted that there were foods in the hamper that they preferred over others, for reasons ranging from ease of preparation to personal taste. Several participants mentioned enjoying and frequently eating noodles, which were often present in the hamper. Others noted that some of the foods they received were not culturally relevant: "But the only thing I really don't like is like chickpeas or something weird like that, because I don't know what to do with them, eh. They're just like extra cans of chickpeas, so I don't know what to do if they come around. I just give them back to the Food Bank when they collect, because I have no idea what to do with them. So that's not even in my culture. I don't even think it's average culture around here. I mean, I've never heard of them until recently. I didn't know what a chickpea was until I came to the Food Bank, and I still don't know what they are, where they come from or what to put them in." Comments such as this stem from the model deployed by the Whitehorse Food Bank, a traditional food pantry model where clients are offered minimal choices. This is in large part because of logistical constraints: as there are usually no locations where food can be stored, hampers are sent already assembled. Some participants spoke about getting items they could not use, which they would save for other people, return to the Food Bank, or pile up at home. One participant specifically said that they would prefer to fill their own bag; another said that a box with canned staples was less useful because of their lack of kitchen access, and a third said that their dietary restrictions meant some items were not things that they could eat. As there is no nutritional value realized from the hamper contents if they cannot be eaten by the recipient, the Whitehorse Food Bank could consider a model that allows for client choices to address these concerns; choice models are generally considered the best practice in the literature, as this approach is trauma-informed and empowering for clients.[2] A choice model can reduce the scarcity mindset that accompanies food insecurity and reduce food waste, as clients will select items that they and their families want to eat (Martin, 2021).

Beyond these common client experiences, five core general insights emerged from the analysis: an emphasis on the hamper as core food on an ongoing basis, the importance of traditional foods, food insecurity and access, the role of the Whitehorse Food Bank in informal networks, and ideal food situations. Each will be described in turn.

Emphasis on the Hamper as Core Food on an Ongoing Basis

Most participants were regular clients who receive a hamper each month; in Whitehorse, where the Food Bank has been operating since 2009, many had been clients for years. A number of participants explained that the hamper has become a staple of their diet, rather than an emergency support to get them through a brief time of hardship,

[2] Trauma-informed approaches seek to "resist re-traumatization of clients as well as staff. Organizations often inadvertently create stressful or toxic environments" (Substance Abuse and Mental Health Services Administration's [SAMHSA's] Trauma and Justice Strategic Initiative, 2014, p. 10) for clients. Basing approaches on guiding principles including (but not limited to) safety, choice, and empowerment is necessary to work with clients in a trauma-informed way (SAMHSA Trauma and Justice Strategic Initiative, 2014).

which is what food banks were intended to do when initially established: "How do I put it, without the Food Bank, I'd be doing without a lot of things … I don't know what in the world. I might be one of those people be knocking on the neighbor's door saying, hey, can I get a couple of slices of bread or something like that?" Participants described planning their shopping around the hamper, mainly by purchasing only items they know they will not receive. For example, one client stated: "Well, the Food Bank comes in handy because I don't have to buy that stuff. And I could buy more meat instead of vegetables and beans and rice and stuff like that." Another client explained his use of the hamper: "It extends the food, you know, that we do have. We get the main thing like the burger and whatever, the meat. And then it helps with the Food Bank because, you know, we get the side dishes like beans or whatever we could put on the side. So helps with that. So that beans, green beans or whatever? Beans, canned vegetables? Yeah, it helps a lot." Research on food bank use between 1992 and 2017 in Vancouver, Canada found that occasional food bank use was common, but that 9% of members engaged in "longer-term episodic or ongoing usage over several years, accounting for 65% of all visits" (Black & Seto, 2020, p. 853). This research shows that food banks providing substantial ongoing food support, rather than emergency food, also takes place elsewhere in Canada.

The pandemic had an impact on transportation, making it more difficult for those who rely on hitchhiking to access food; and in communities that offer bus service through the local First Nation to Whitehorse, fewer seats were available to allow for physical distancing. One participant described difficulties in getting to Whitehorse: "I haven't been there for a while now. I still have my food voucher and I can't get a ride in. I haven't been able to get a ride in." As emergency food through the Food Bank has become more accessible in Yukon communities, residents who may have had trouble obtaining this support prior to the pandemic because of lack of transportation to Whitehorse have come to rely on it as an important and consistent source of food.

Some clients in communities expressed fear of the program being canceled: "I don't know what would happen if it's going to shut down, you know, it's gonna hurt a lot of people." There are fewer other food supports available in smaller communities, and supports that were available before the pandemic ceased to operate during COVID-19. One support is community dinners, described as an important "soft" source of food support by participants from other organizations: "There were a lot more community meals like gathering together to talk about a topic or that sort of thing, so people could access food … without having to acknowledge that they needed food, they just could just go to a supper and participate." Another way that the pandemic impacted families was having kids at home from school, and changed eating habits due to disrupted routines: "The prices rose. Yes. And I'm cooking more or more snacking. You know, I'm giving more snacks to the kids because I took them out of the school for the pandemic. So that means I was digging in my cupboards more. So it kind of made me dig in my pocket more. Now here I am … I just notice a lot of COVID eating, I call it. Yeah, COVID eating because there's nothing else to do, you sit in the box and entertain yourself with food. That's what I noticed."

The importance and complexity of food in everyone's lives demands a multi-tiered approach. A matrix of supports is required to help meet the short- and long-term nutritional, social, and economic- challenges accessing sufficient, nutritious, and culturally relevant foods. The Food Bank should only be considered one of the supports that address Yukon food needs. But currently there is a gap in food options available for Yukoners: although there are some free services for food, including the Food Bank's hamper program, some support available through schools and First Nations, and some lunch programs in Whitehorse, there are no alternative options that are subsidized or based on a pay-what-you-can model.

Importance of Traditional Foods

Traditional foods are important for meeting nutritional needs in First Nation communities (Robidoux et al., 2021). Harvesting traditional foods and related activities satisfy important cul-

tural components of people's lives, providing a sense of purpose and belonging: "For Northern Indigenous Peoples, food security is more than just having a full stomach; food is linked to identity, culture and way of life" (Butler Walker et al., 2017, p. 33). Client participants spoke about the importance of traditional foods in their diets, some describing experiences with harvesting food from the land: "Beautiful. Everything. I did everything. I got a moose with my mom. A buffalo, and everything." Some talked about how they no longer have access to areas where they know what and how to harvest, nor the community and family support to undertake harvesting: "Right now, I would have been out on the land in the coast for a moose, maybe a couple of caribou to fill up our freezers to be ready for the winter. Yeah … that's what I left behind. The difference is I left my tradition of hunting. You know, in the summertime we harvest beluga whales, our family, that's another thing I left behind." No longer having access to harvesting increases reliance on commercially available foods, which do not offer the same cultural meaning and fulfillment. There was a very strong link between family relationships, sharing food, and land-based foods in the analysis. Often, participants described undertaking harvesting with family members and then sharing their harvests, or family members sharing with them: "Well, my mom and dad help me out too. With moose meat and stuff."

Transportation issues were intertwined with food insecurity, including with access to traditional food sources. Some clients lack transportation to undertake on-the-land activities even if they have the gear and skills: "And since I've been staying in town, I don't hunt as much, but I have like hunting gear. I have like a gun and some bullets and stuff. But I just don't. Over ten years ago, I got charged with impaired and I never bothered to get my license back because I just don't have the money to pay the fines or anything like that." Others described how hunting pressure from those with resources to purchase trucks and quads, who presumably have the means to purchase food but prefer to hunt, were making it more challenging to get out on the land for those with greater food insecurity and lower income: "They got 70, 80 thousand dollar trucks, trailers, four quads and who can afford all that? Why don't you just go to the store and buy it instead of going out on the land. You're snuffing out most [of] the animals." Some participants described more access to traditional foods as their ideal food situation. A non-client participant talked about a relative's preferences for traditional foods toward the end of her life: "But you know, it's the same thing she wasn't eating and everything. And finally, we went over there and she just said … you guys always bring me food, but she's like, you know, it's not the food that you know that I grew up on, right? She wanted, she wanted beaver meat. She wanted grouse. She wanted, but she wasn't a big fan of, you know, pork and chicken and, you know, like the store-bought chicken. So, you know, and then so once we started seeing those needs … those are specifically First Nations' needs. They need that traditional food." In the smaller communities, some representatives from other organizations said that up to 90% of the people belonging to their respective First Nations rely on traditional foods harvested from the land; other literature has also emphasized the importance of traditional foods in the diets of Northern peoples (Walch et al., 2018).

Food Insecurity and Access

Most research on food insecurity focuses on it as an income problem. However, additional income does not solve the problem of access to grocery stores in remote communities, or to traditional foods threatened by hunting pressure and climate change. In remote communities, food is more expensive: "So right now, I'm dreaming about a cauliflower. It's on sale this week. For $4.99." In addition to being more costly, food is often less fresh than options available in Whitehorse: "By the time you get your bread home, it's moldy. Let's put it that way." In terms of official definitions of food security, individuals in Yukon communities are lacking the consistent physical and economic access to meet their food preferences and needs. Food security research often focuses on food insecurity as a problem of insufficient financial resources, and emphasizes the need for policy responses that increase income to address food insecurity (Loopstra, 2018; Tarasuk et al., 2022). Although more income would help these clients

access more foods from their local grocery store, and perhaps get to Whitehorse more frequently to purchase cheaper and fresher items, more income would not fully address food insecurity because fresh, high-quality foods are unavailable on a regular basis in their community. In remote areas, policies that increase income would need to be associated with initiatives to increase access to nutritious, fresh, and culturally relevant foods in sustainable, community-led food systems to more fully address food insecurity (Budd Nugent et al., 2022; Wilson et al., 2020).

Transportation is a challenge in different ways depending on where participants live. Clients in Whitehorse who rely on public transit described challenges getting all their hamper items from the Food Bank back to their home because of infrequent service. One participant specifically mentioned returning items that they are less likely to use because they cannot carry their entire hamper home in backpacks on the bus: "Yes, carrying a back bag home. On the bus … usually it's me and my partner, he's got a big backpack. I got a big backpack. We took out what we need and what we don't use. So we don't use much tomato sauce, or much tuna. Or beans. And so we put that back." In communities with no public transit (all communities except Whitehorse), clients who had cars described informal networks of coordinating picking up hampers for others. Delivery options in some communities lowered barriers to access. Clients also mentioned challenges in getting to Whitehorse to purchase in bulk less expensive non-perishable items that are prohibitively expensive or unavailable in their home communities: "Yeah, you can't buy toiletries. Dog, animal food, but you know those things. Laundry detergent, at that place it'll put you right in the poorhouse." A participant said that he prefers to purchase in his community, and factors transportation costs into his grocery shopping: "Because they're a lot cheaper there, like the price in Whitehorse. Yeah, and here they're twice as much, but still cheaper than going to Whitehorse, right?"

People in smaller communities are more likely to rely on harvesting traditional foods to have enough food for winter, while climate change and hunting pressure are making harvests more difficult. Participants from smaller communities in particular talked about declining wildlife populations, even among non-hunted species: "Used to be a lot of birds. … There's no chickadees. Do you see any around? No." Because the Yukon government implemented a self-isolation requirement upon returning home to the territory until May 2021 (Government of Yukon, 2021), many residents who normally would have spent vacation time outside the territory did not leave, and anecdotally, camping, hunting and fishing were undertaken more frequently. Participants thus described increased hunting pressure during the COVID-19 pandemic, along with other impacts, leading to more challenging hunts for moose, taking longer because hunters need to go farther to be successful: "When you talk about that, then it turns into … is it worth it financially to, you know, go on a three- or four-day moose hunt when you have to travel those distances, right?" Another participant spoke about declining salmon populations, and how their children will not have the same experiences with regular fish camps where important intergenerational cultural learning takes place: "She's with me a lot and she'll tell people, there's no fish, there's no fish. That's why we can't go to fish camp. And she'll tell them, do you remember fish camp? So it's really interesting to see that these generations are already being affected. And so, yeah, that piece is really, really sad and really, really detrimental, and we don't know how to fix it." The strong traditional connections between culture, relationships, and food security are negatively affected by environmental factors.

In Communities, the Whitehorse Food Bank Serves as the Backbone of Informal Networks Supporting Food Needs

A consistent theme from the interviews with representatives from other organizations was that the Whitehorse Food Bank serves as the foundation of a network linking nonprofit supports in communities. The expansion of Food Bank services has nurtured creation of partnerships that are both beneficial and fragile. These networks were created as a direct response to the request to widen the Food Bank's service area during the pandemic the Food

Bank supplies the food, and the partners distribute it in the community. These partnerships may be fragile in the sense that they are held together by a couple of key people who are "community pillars": the relationships they have built are strong but depend on the presence of those individuals. As described by one participant: "It's the Yukon. … It's all about relationships, right? Like, those informal relationships are so important in transmitting knowledge, right? … The established formal meetings are important, but so often a lot of it happens because we're having tea."

The benefit of the networks is that the Whitehorse Food Bank has been able to expand beyond what their resources would otherwise allow. Building the hampers in Whitehorse and shipping them to communities, smaller groups of volunteers can manage distribution that supports a significant percentage of community members. For example, one participant reported on her experience leading distribution in her community: "So it's about, like all told, somewhere between 50 to 60 man hours per month, including my time for organizing. … But aside from the cost to the Whitehorse Food Bank, 60 hours is not much, and it's spread around you know, by 10 people. So, you know, it's pretty good bang for the buck. … It would get really hard to do if [the] Whitehorse Food Bank couldn't produce the hampers for us and pay for them and cover the cost of freight. Like if the Whitehorse Food Bank didn't make the hampers, we're done. Our program is done. Like there's no way we have the infrastructure to do the assembly of hampers every month." This speaks to the limited volunteer resources in smaller communities, where managing all the steps in the distribution process would not be possible.

Another component of network building in which the Whitehorse Food Bank could potentially play a lead role would be to facilitate information sharing between communities and organizations. There was a need expressed by some representatives from other organizations involved in food security work to hear about what is happening across the Yukon, in part to improve their own work and also to learn lessons and avoid reinventing the wheel: "What are you doing in your community? How is it working? Because at the end of this, we might get some information from another community that's doing something and said, Hey, that could work here, right? So I think just more information sharing between communities would be good." The Whitehorse Food Bank seems uniquely positioned to contribute to information-sharing networks as the organization that is the hub to all the spokes in different communities.

Ideal Food Situations

We asked both clients and representatives from other organizations what an ideal food situation would look like for them or their community. Clients offered insights from their own individual perspective (often after asking for clarification as to what an ideal food situation meant). A recurring point was simply having access to abundant food at home: "Whenever I need something I'm just able to open up the cupboard and be able to take it out." Others stated having more access to meat, fruit and vegetables, and a way to grow or harvest these things themselves: "I'd say lots of fruit and vegetables and be able to grow them or be able to have access to them. So this would be my ideal." Affordability of food also came up, with one participant stating that more foods should be free. Some participants mentioned easier access to foods that fit their dietary restrictions, which are often costly: "It is quite hard because the foods I eat is expensive. So two weeks on, I have to do without [those] foods. Because I have to eat certain foods for my thyroid." Another common theme was that an ideal food situation would be having more high-quality food: "A prime rib roast. [laughs] I haven't had one of those in a long time." Sometimes this meant more land-based or traditional foods. Often participants looked back to times when they could afford to purchase their preferred foods: "Years ago, when I was working, though, I would always go to the [local butcher] and buy big boxes of meat and stuff like that. And that would last me for a month. Throw it in the freezer and it would last. Yeah, that would be an ideal food situation for me where I was working, and I can just walk into the store and buy everything I needed and all the meat from the [local butcher]."

The representatives from other organizations framed their explanations of ideal food situations

more from a community perspective. The major theme emerging from their responses was the need for layered and holistic solutions to food insecurity (although, interestingly, none of our participants mentioned income, which is touted as the best policy solution to food insecurity). Solutions described included Meals on Wheels programs or other meals for elders, funding for food in schools and daycares, and a soup kitchen for those experiencing homelessness, all of which could be linked with other supports. Sometimes this was framed in the context of a food hub or other network. Some participants also spoke about the need for food literacy and skill-building programs related to cooking, gardening, and butchering, including preparation of sausages or other long-lasting foods. Another facet of food security mentioned multiple times was the desire to grow more food locally: several participants mentioned community greenhouses (which, in some cases could be heated through waste heat from other buildings) and more farming for meat and eggs. One participant pointed out that these initiatives could provide not only food security in smaller communities but job security as well. A newer technology of interest is hydroponic growing systems, which could produce vegetables year-round and could be located in buildings such as schools and incorporated into their programming: "So how do we integrate food like completely differently than we have before? Right now, people don't even know where the food is growing, … Then they come to school to do a little like hydroponics programs or something like that for the kids where they can actually learn how to do it at home."

Conclusions

This study highlights the lived experiences of Yukoners in Whitehorse and smaller communities with food insecurity and food bank services during the COVID-19 pandemic, along with community-based perspectives of those working in organizations involved in food security. Threads that emerged from the interviews with food bank clients included common experiences tied to difficult life events precipitating food bank access, experiencing severe food insecurity, the mental burden of poverty, and preferences for certain types of food and more choices. Some important insights from this research include that participants are often relying on the emergency food hamper to meet their core dietary needs, and thus plan any grocery shopping they do to purchase only items they know that they will not receive in their hamper. Further, traditional foods hold an important place in the diets and lives of participants. Because of limited access to fresh foods in communities outside of Whitehorse, merely increasing income supports—a commonly recommended policy response to address food insecurity—would not completely alleviate food insecurity for these participants, because they lack physical access as well as economic access to fresh, preferred foods.

At present, no single solution will address the problem of food insecurity in Yukon communities, so layering initiatives could contribute to food security and resiliency for the entire territory, which is currently vulnerable to food shortages in emergency situations that close the Alaska Highway. Because Yukon communities are so small and so extremely far apart, "the distinctions between commercial, community, and subsistence production are much more fluid than in other parts of Canada" (Wilson et al., 2020, p. 298). A further consideration for food security in the Yukon is the sustainability of fish and wildlife populations because of the cultural importance of these foods, especially in First Nations communities. Furthermore, a broader community focus on food security and improving it at a community level could have a positive impact on attitudes that would reduce the social stigma associated with experiencing food insecurity on the individual level.

Overall, there is a greater role for government to play in addressing food insecurity; in small, remote Northern communities, policy responses should be linked to community needs and explore options to both increase income and access to fresh, culturally appropriate foods. Appropriate responses should also address access to housing and transportation, as insecurity in these areas is tightly linked with food insecurity. Ideal food situations described by client participants focused on access and abundance; non-clients spoke about community-oriented, layered, and holistic approaches to improving food security for the

entire territory. This project largely focused on describing experiences with food insecurity and accessing food bank services during a specific, unusual time period; future research could explore opportunities for solutions and community initiatives for improving food security and building food systems in a more sustainable way following the COVID-19 pandemic (James et al., 2021), in the unique context of the remote and sparsely populated Yukon Territory.

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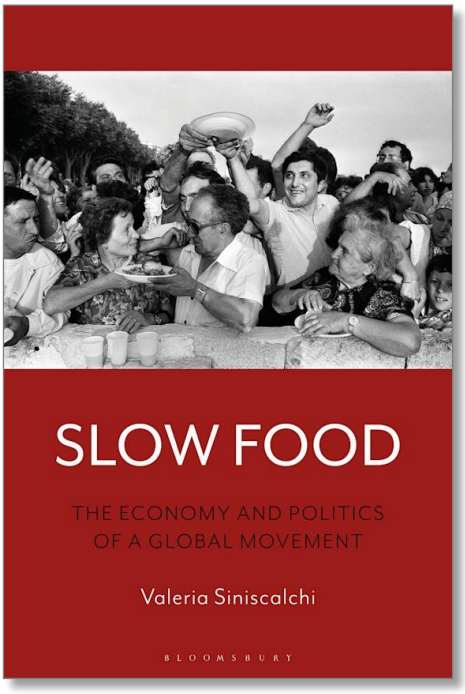
The *spia* who loved food

Book review by
Natasha Bernstein Bunzl *
New York University



Review of *Slow Food: The Economy and Politics of a Global Movement*, by Valeria Siniscalchi. (2023). Published by Bloomsbury. Available as hardcover, paperback, Ebook (Epub, Mobi, and PDF); 256 pages. Publisher's website: https://www.bloomsbury.com/us/slow-food-9781474282444/

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In 2012, for the first time, two of Slow Food's major events shared a single space and ticket: The Salone del Gusto, a large commercial food fair, and Terra Madre, a political conference that brings together a worldwide network of small farmers, food producers, activists, and scholars dedicated to biodiversity and "participatory democracy." In the penultimate chapter of Valeria Siniscalchi's monograph *Slow Food: The Economy and Politics of a Global Movement,* she uses the relationship between these two simultaneous flagship events to explore a dichotomy that her entire book grapples with: is Slow Food more about "the market" or "the community"? "Competition" or "mutuality"? "Politics" or "economics" (p. 203)? Siniscalchi's answer is that Slow Food, the international organization that encompasses an events team, a publishing house, a university, a national and international political structure, and more, is about all of the above. In the case of Salone del Gusto and Terra Madre, she argues that if at first these two events seem contradictory, they are actually "complementary spaces presenting ways to create new economic forms, to imagine a new

* Natasha Bernstein Bunzl is a PhD student in food studies at New York University. Her research focuses on government and nonprofit food access programs and the impact of food insecurity on the lives of individuals living in New York City. Bunzl can be contacted at New York University Steinhardt School, Department of Nutrition and Food Studies; 411 Lafayette Street, 5th Floor; New York, NY 10003 USA; nb3335@nyu.edu

economic order and to determine new food policies" (p. 204). Slow Food is thus hard to pin down, and Siniscalchi argues that anyone trying to do so misses the point: Slow Food contains "two visions with different approaches to the social reproduction of the movement" (p. 222) and the coexistence of these visions *is* the point. From the start, she is interested in exploring the "opacity of this object" (p. 1), and from her unique position of access, she is able to respect its unknowable quality while still bringing the inner dynamics to light.

The first chapter offers her method, an exploration of her positionality, and a brief theoretical discussion of how other scholars have dealt with Slow Food and what it means to study a food movement. The second tells the history of Slow Food, starting prior to the association's founding with the proto-organization "Arcigola," a leftist association of "gourmets dedicated to good wine and good food and to local culinary traditions" (pp. 21–22). This chapter importantly demonstrates the political origins of Slow Food and its founding members' intensely ideological bent. Chapters 3, 4, 5, and 6 approach the questions of internal functioning and power struggles as the organization has grown. Siniscalchi looks at the hierarchies within the headquarters in Bra, Italy, how Bra manages relationships with other regions of Italy, and how Slow Food Italy manages relations with international chapters such as Slow Food France. Chapter 7 offers a fascinating discourse analysis of the movement's slogan "good clean and fair." Chapter 8, perhaps the book's most successful chapter, brings together a series of case studies that explore how Slow Food influences, protects, and shapes European cheese markets. Chapter 9 explores the way that Slow Food uses the concept of "taste" to define itself, creating opportunities for both inclusion and exclusion. Chapter 10 includes an interesting analysis of the restaurant guide produced by Slow Food and how its wine guide has struggled to manage commercial success while holding onto organizational principles. Chapter 11 outlines the evolution and purpose of Slow Food's three major events: Salone del Gusto, Terra Madre, and the off-year Cheese, focusing on the tension between emphasizing lucrative sponsorships and more radical initiatives. Finally, the conclusion, "The Pragmatic Utopia of Food Activism," asks where the values of the organization exist today. Not surprisingly, her conclusion articulates that they are ever adapting.

Siniscalchi's perspective is shaped by her unique position as "la spia" (the spy), an outsider hidden on the inside of this inscrutable organization. As a French and Italian speaker, who informally participated in Slow Food in France and Italy before beginning her official study, she was able to both observe—almost invisibly, without asking for translations or clarifications—and also play an active role when appropriate. For instance, she occasionally has written for Slow Food publications. By the time she began formally researching the headquarters in Italy, she had developed relationships with major and minor figures in the movement and had earned their trust. This position is acknowledged by the author and her interlocutors; at one point she cites the fact that "several of the movement leaders, including Carlo Petrini, president of Slow Food, told me that they felt I was the only one who has an overview of Slow Food, who knows all its mechanisms in the different offices and services" (p. 7). The story behind how she got her nickname (it was bestowed on her by Piero Sardo, president of the Slow Food Foundation for Biodiversity) exposes her intimacy with the organization's inner circle and the unique perspective that she possesses compared to other scholars. Her closeness to the central leaders of Slow Food shines through most clearly in moments where she refers to Carlo Petrini, founder of the movement, by his nickname "Carlin." This proximity to the organization allows Siniscalchi to share a close account of the many arms of the Slow Food movement, making a unique and major contribution to the field of scholars dedicated to understanding Slow Food. However, at times this proximity may be a constraint, as it leaves her just short of criticizing the organization herself. She writes that she often held opinions that were "more radical than those of my contacts" (p. 9), but she put this aside in order to reveal the object of her study: how the organization worked. She is explicit that she did not aim to evaluate the coherence of the organization's philosophy or actions, although at times it seems like this evaluation

would have strengthened the text. Throughout the book, Siniscalchi cites critiques articulated by other scholars, but often responds to them with the organization's party line. For instance, I would have liked to see her explore the political ramifications of inviting politicians from both the left-wing and right-wing parties of Italy to speak to the allegedly militant organization instead of hedging by implying that the capricious nature of Italian politics almost made these invitations irrelevant against the persistence of Slow Food. She cites scholar Adrian Peace's argument that the 2006 Terra Madre was "political theatre," but Siniscalchi herself does not build on the consequences of the organization's political agnosticism. She contends that Slow Food is important for politicians across the spectrum and therefore has power, but from political participation alone, it is already clear that Slow Food possesses power. The question, which would have been valuable to evaluate from Siniscalchi's proximate position, is what the organization does with its power. More could have been done to consider the consequences of Slow Food from the vantage of broader politics.

Another arena in which Siniscalchi seems too lenient with the organization is with her discussion of gender. Although she repeatedly refers to the absence of women in the early days, the paucity of women in leadership roles today and the numerous sexist comments that were jokingly thrown her way —at one point, one of her interviewees responded to her joke that maybe she could be president with, "That's impossible, you forget you're a woman!" (p. 118). Thus she fails to really grapple with gender in the organization. She acknowledges that the election of Vandana Shiva to the position of vice president is significant although largely symbolic, but I would have liked to see her truly interrogate whether Petrini's call for "indigenous people, peasants, women and the elderly … [to] be at the front line of the challenges" (p. 120) really represented a substantive indication that "the women who are vital to the daily functions of the association inside the territory [can now] … think differently about the role of women within Slow Food" (p. 120).

As with any book, the text will mean different things to different readers. One wishing for a glimpse into the candle-lit osterie of Bra, where the leaders of Slow Food clink glasses and debate, will be thrilled. Carlo Petrini, Piero Sardo, and other famous Slow Food figures feature prominently, debating whether the organization should focus on its pleasure-oriented origins or turn a page into a visionary global future. Their conversations play out in cited speeches, correspondences, memos, and anecdotes that exist beside data from in-depth interviews with Slow Food actors up and down the organizational hierarchy. Readers looking to confirm their belief that Slow Food is too connected to big industry and established politicians across the Italian spectrum and lacks a singular mission will find evidence for their concern. Readers wanting to delve into the minute details of this both deeply Italian and global story should pick up this book.

When I turned the final page, I felt like I had been sitting for hours around a long table with dozens of loud, opinionated, dissenting voices with big plans for the world, emboldened by bottles of wine and platters of meticulously sourced food products. This book provides a rare glimpse into the Byzantine structures of this international organization and its evolution over time. I am looking forward to reading scholarship that builds on this work. Siniscalchi has shown us that slow food is many things; future research might use her argument to evaluate what Slow Food accomplishes.