Journal of Agriculture, Food Systems, and Community Development

Volume 4, Issue 2
Winter 2013–2014

JAFSCD

www.AgDevJournal.com
ISSN 2152-0801 (online only)

Published by the Food Systems Development Project of the Center for Transformative Action with the support of:

Johns Hopkins Center for a Livable Future
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The University of Vermont

Journal of Agriculture, Food Systems, and Community Development

Published by the Food Systems Development Project of the Center for Transformative Action and with the support of our institutional sponsors:

The *Journal of Agriculture, Food Systems, and Community Development,* ISSN 2152-0801 (online only), is published quarterly (Summer, Fall, Winter, Spring) by the Food Systems Development Project of the Center for Transformative Action (an affiliate of Cornell University). Journal office: 295 Hook Place, Ithaca, NY 14850 USA.

Online subscriptions: Farmer/Student/Sole Proprietor/Retiree: US$39; Agency/Nonprofit Staffperson: US$49; Faculty/Consultant/Corporate Employee: US$69; Institutional Library: US$227–US$658 (based on FTE students).

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
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On the cover: Walter Jeffries lectures his pigs in 2014 on economic systems at Sugar Mountain Farm (SugarMtnFarm.com) in the mountains of Vermont, where his family raises pastured pork they deliver locally. While feigning attention, the pigs were just there for the free lunch.

(Photo copyright © 2014 by Walter Jeffries)

(Continued)

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Book Reviews

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
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IN THIS ISSUE
DUNCAN L. HILCHEY

A good late winter's read

Published online March 19, 2014

Citation: Hilchey, D. L. (2014). A good late winter's read [Editorial]. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 1–2. http://dx.doi.org/10.5304/jafscd.2014.042.017

What a long winter this has been in the Finger Lakes region of upstate New York — so much so that the weather might, in fact, be affecting my judgment and sense of humor. We'd normally use a more earnest cover related to a topical theme of the issue, but I couldn't help choosing the very droll image of Vermont farmer Walter Jeffries in his shorts and boots out in the snow appearing to lecture his livestock. It's still the season to enjoy reading, so if you're housebound like we are, it might be a good time to curl up with your tablet, laptop, or other technology and read through this complete issue of JAFSCD. With any luck I'll be using a warm and colorful spring image for our forthcoming issue!

We start out this open call issue with contributions from our four columnists. *Governance* is a term that is cropping up increasingly in submissions to JAFSCD, and in her column *Digging Deeper,* **Kate Clancy** applies the concept to food systems policy and supply chain development. Good governance requires good data argues **Ken Meter** in his *Metrics from the Field* column, but in this era of fiscal austerity some national data sets useful to policy-makers, practitioners, and scholars are on the chopping block. *In Global Views of Local Food Systems,* **Rami Zurayk** uses a plethora of data he's gathered to show how the dual crises of drought and war are devastating local and regional food systems in the Levant. Finally, giving us a preview of what's to come in our spring issue, **John Ikerd** provides a thought-provoking essay, suggesting that "'Survival of the fittest' means survival of those who successfully integrate the seemingly opposite tendencies of competition and cooperation."

Our winter issue's first paper is *Land Trusts and Beginning Farmers' Access to Land: Exploring the Relationships in Coastal California* by **Jessica Beckett** and **Ryan Galt.** The authors argue that agriculture-related land trusts could do much more to support and sustain the farmers they host on their properties.

Next are two papers focused on improving access to good food at farmers' markets. In *Evaluating the*

On this issue's cover: Walter Jeffries lectures his pigs in 2014 on economic systems at Sugar Mountain Farm (SugarMtnFarm.com) in the mountains of Vermont, where his family raises pastured pork they deliver locally. While feigning attention, the pigs were just there for the free lunch. *(Photo copyright © 2014 by Walter Jeffries)*

Economic and Nutrition Benefits of EBT Programs at Farmers' Markets, **Kristin Krokowski** finds in a study of 10 farmers' markets that, while SNAP beneficiaries increased their consumption of produce, farmers experienced little increased sales. The impacts, however, may vary by location and demographics. In their study of healthy food access at one farmers' market, entitled *Evaluating the South Memphis Farmers Market as a Strategy To Improve Access to Healthy Foods: Lessons from 2011,* **Kathryn Hicks** and **Katherine Lambert-Pennington** found significant mutual benefits between consumers and the farmers who accepted vouchers. Continuing the theme of addressing community food insecurity, **Vincent Smith** and **John Harrington** estimate the volume of community food production (e.g., from school, educational, and community gardens) in the city of Madison, Wisconsin, and find considerable underutilized production potential in *Community Food Production as Food Security: Resource and Economic Valuation in Madison, Wisconsin (USA).*

This is followed by two papers focusing on meat products. In *Beyond the Farmer and the Butcher: Institutional Entrepreneurship and Local Meat,* **Lauren Gwin** and **Arion Thiboumery** share case examples of four projects that are successfully navigating the complexities of developing meat value chains. And in *Premium Potential for Geographically Labeled, Differentiated Meat Products,* **Kynda Curtis** reports on a study of Nevada consumers' willingness-to-pay for high-value origin-labeled meats, and gets some surprising results.

Two papers focus on organic production. In his paper *Resource-Use and Partial-Budget Analysis of a Transition to Reduced-Input and Organic Practices and Direct Marketing: A Student-Farm Case Study,* **Sean Clark** uses the Berea College student farm in Kentucky to look at the bottom line results of converting to more sustainable production and marketing activities. **Alice Beban** then follows with an examination of the potential for the adoption of organic practices in Cambodia. In *Is Organic Agriculture a Viable Strategy in Contexts of Rapid Agrarian Transition? Evidence from Cambodia,* she finds that maximum benefit to organic production can only be attained in the context of significant rural development policy changes.

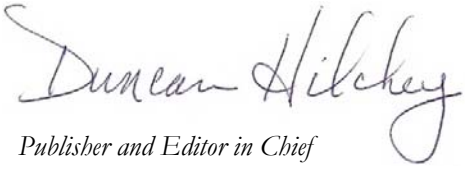
In *Development and Evaluation of an Introductory Course in Sustainable Food and Bioenergy Systems,* **Kate Malone, Alison Harmon, William Dyer, Bruce Maxwell,** and **Catherine Perillo** offer a case study of their pilot interdisciplinary, team-taught, experiential education course, including a student evaluation that highlights what worked well and future modifications required.

Our last paper of this issue is *Can Large Retailers Localize Supply Chains? A Case Analysis of the Challenges Facing One Canadian Retailer* in which **Doug McCallum, Alissa Mae Campbell,** and **Rod MacRae** conclude that localization of product supply for a large grocery cannot happen without significant investments in product differentiation, a financially viable supplier base, strategic alliances, and shared governance.

Finally we offer two book reviews. In *Leveraging Social Change Through Collective Purchasing,* **Holly Chaille** reviews *Beyond Alternative Food Networks: Italy's Solidarity Purchase Groups,* by Cristina Grasseni, and suggests that Italy may have some interesting lessons for North Americans to consider.

And in *Exploring Food, Agricultural, and Environmental Law and Policy Reforms,* **Sheila Fleischhacker** reviews *Food, Agriculture, and Environmental Law,* edited by Mary Jane Angelo, Jason Czarnezki, and Williams Eubanks II, and finds it a very practical examination of a wide range of legal and regulatory issues facing the U.S. food system.

Here's hoping for a lovely spring (or fall) in your neck of the planet.



Publisher and Editor in Chief

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

DIGGING DEEPER
Bringing a systems approach to food systems
KATE CLANCY

Food system governance

Published online March 17, 2014

Citation: Clancy, K. (2014). Food system governance. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 3–6. http://dx.doi.org/10.5304/jafscd.2014.042.012

Following on my columns on *scale* (fall 2012) and *feedback loops* (spring 2013), I want to turn to another systems concept that is difficult and sometimes risky, but one that has to be embraced if we are to reach our goal of sustainable, resilient food systems. The concept is *governance,* which in general is understood as "managing, steering and guiding of public affairs by governing procedures and institutions in a democratic manner" (Pisano, Berger, Endl, & Sedlacko, 2011, p. 3). Governance has resonance in many different settings, but two are of particular interest: the first is the relevance and efficacy of organizational structures that we encounter and work with in attempting to change policy; the second is the governance of supply chains, which is so critical to any chain's success.

I'm echoing some of the ideas in a recent article by the Nourishing Communities research group out of Ontario, Canada (Blay-Palmer et al., 2013). I'm also impressed with the sophisticated thinking going on around governance and sustainable development, the objective of which is to achieve simultaneously the population' s economic well-being, environmental protection, and social equity (Pisano et al., 2011). The idea is that governments and other institutions have to be open and capable of "steering societal development along more sustainable lines" (Meadowcroft quoted in Pisano et al., 2011, p. 4). This is no small task because most democratic institutions are fixated on economic growth and not on the common good as represented in sustainability and social justice (Bosselmann, Engel, & Taylor, 2008). Of course

Kate Clancy *is a food systems consultant, visiting scholar at the Center for a Livable Future, Bloomberg School of Public Health at Johns Hopkins University, and senior fellow at the Minnesota Institute for Sustainable Agriculture. She received her bachelors and Ph.D. degrees in nutrition at the University of Washington and the University of California Berkeley, respectively. She has studied food systems for over 40 years and has held positions in several universities, the federal government and two nonprofit organizations. Her present interests are regional food systems, food security, agriculture of the middle, and policies at all levels to encourage the development of resilient food systems.*

governance exists at all levels — global, national, regional, local, and corporate — and tends to be challenging because comprehensive approaches to both sustainability and development require an integration across many sectors, stakeholders, and levels of politics (Pisano et al., 2011). Flexibility is another prerequisite. All the social and environmental "actors" are in motion all the time — so plans and strategies that aren't collaborative and adaptive will not hit the mark.

One of the challenges of governance in achieving sustainable development is that there is a lot of uncertainty about what the end goals should be. Secondly, people grappling with sustainability issues must engage a long horizon, when we all know that policy-makers usually have a short-term orientation. A third challenge is that success means figuring out how to get people to agree across multiple levels of functional administrative boundaries where there is little history of coordination and cooperation. Furthermore, sustainable development requires a balancing of economic, social, and environmental interests and policies to minimize negative effects and maximize synergies (Pisano et al., 2011).

Flexibility is another prerequisite. All the social and environmental "actors" are in motion all the time — so plans and strategies that aren't collaborative and adaptive will not hit the mark.

A good real-life example of one of these challenges is that faced by the Missoula Food Policy Council (Hubbard & Hassanein, 2010). As in most places in the U.S., land-use decisions are made at the local level (i.e., at the county or city level in the case of Montana, and towns or townships in many other states). The Missoula Food Policy Council has been trying for years to get the county to address farmland protection, with little success. The city is ready to do something, but most farmland, naturally, is not inside the city limits. These jurisdictional constraints limit the ability to address land-use, even though the farms and ranches producing food for the county and beyond cover a much wider region. Through a governance lens the task in cases like this is to identify a way to determine at what scale certain land-use decisions should be made in order to arrive at what could be a sustainable outcome. For example, it might be through a regional planning agency or through a new network set up to influence these decisions. One process that might be helpful is collective impact — a group of people coming together from different sectors with a commitment to solve a specific problem together. These collaborations, described in detail by Kania and Kramer (2011, 2013) are not plentiful yet, but look like they are worth pursuing under the right kind of shared leadership.

As to supply chains, without good, savvy governance they won't succeed. They need a governance *structure,* which is the way in which a chain is organized, its involvement with other organizations, and its legal status (for example an association, cooperative, or company). They also need a governance *process,* which is how the chain is governed, such as its decision-making procedures, contractual arrangements, and style of governance (e.g., a lead commander or a consultative process (Roep & Wiskerke, 2012)). Supply chains face many of the same challenges addressed above. These include the diverse goals, priorities, and values of the members of the chain (Geels in Hinrichs, 2014), networks across sectors and scales, power relationships among many different players in the chains, and other factors. There also must be flexibility in order to negotiate accommodations to different priorities. In order to enhance their viability, new and established food supply chains need to think about utilizing open governance processes as they start up and scale up. These are also called *reflexive processes,* in which people engage to discuss tensions regarding group objectives, recognize contradictions, and deal with differences in a respectful way (see DuPuis & Goodman, 2005; Hassanein, 2003; Mount, 2012).

This seems like a time-consuming task and a challenging undertaking, but there's useful

guidance in Phil Mount's article (2012) and also in his presentations. We have several examples of values-based supply chains that are utilizing these governance concepts.[1] And a new analysis out of England brings climate change into the discussion and underscores a need for more open processes, by pointing out that since global warming is affecting resource constraints such as water availability, companies not only have to increase the range of their suppliers but also need to build stronger relationships that will share costs and risks more fairly across a supply chain (Thorpe & Fennell, 2012; see also Miller, Anderson, Francis, Kruger, Barford, Park, & McCown, 2013). Furthermore, it has been suggested that food system organizations might call on colleagues in academic institutions or nongovernmental organizations with the knowledge and the time to assist supply chains in adopting more reflexive processes (Roep & Wiskerke, 2012).

Unfortunately there don't appear to be a lot of precedents for following a sustainable development and governance path in the U.S. Most of the political activity and research have been happening in Europe, and although there are institutions and individuals in the U.S. working on the question, most of this appears to be directed outside of the U.S.; virtually none of it is looking at food systems issues inside the U.S. in this framework. There is the great work of our Canadian friends I mentioned earlier (maybe their influence will rub off?). And a very new report by Forster and Escudero (2014) does include a chapter on food system governance. The authors are focused on urban areas and their immediate regions , and all of the examples in the chapter are international ones, but they have a useful discussion of institutional frameworks that "support dialogue, assessment, prioritization and new practices, which are often themselves the result of political will, charismatic local leadership and or policy design" (p. 30). I hope that there will be much more thought and research on food systems governance in North America, and I join others in looking for places where different models of governance are being tried so they can be evaluated and emulated.

[1] See http://www.agofthemiddle.org for other examples.

Acknowledgments

Thank you to Neva Hassanein for her assistance with the Missoula example.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

METRICS FROM THE FIELD

Blending insights from research with insights from practice

KEN METER

Local data is endangered

Published online March 7, 2014

Citation: Meter, K. (2014). Local data is endangered. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 7–8. http://dx.doi.org/10.5304/jafscd.2014.042.010

One of the quiet impacts of the interruption of federal services in the U.S. — both the ongoing sequestration and the fall 2013 shutdown — was a tragic loss of local-level economic data. This critically threatens our ability to measure the success of community-based foods initiatives.

The Bureau of Economic Analysis (BEA), a unit of the U.S. Department of Commerce, has enjoyed a deservedly solid reputation for publishing impartial data sets. Its Local Area Personal Income Statistics (LAPI), in particular, have offered essential measures of local economic activity. Few nations have comparable data.

Yet on November 21, 2013, BEA (2013b) announced that it had suspended publication of several critical local data sets. No longer will BEA report detailed data on farm income and expenses for counties across the U.S. It has stopped reporting transfer payments (such as SNAP benefits) at the county level. BEA will no longer publish local area employment data by industry, nor detailed local summaries of employee compensation or earnings. Gone are its compilations of data covering BEA economic areas (regions defined by economic trade rather than strictly political boundaries). The BEA has also eliminated its Regional Input-Output Modeling System (RIMS II) product — an essential tool for gauging economic impacts of local development plans.

BEA understands the critical importance of its own data. In its press release announcing the cuts, BEA stated, "LAPI [data] constitutes [sic] the only source for county and metropolitan area personal income statistics and are building blocks for other

Ken Meter, *president of Crossroads Resource Center, is one of the most experienced food system analysts in the U.S., having produced 97 regional and state food-system assessments in 32 states, all focused on local farm and food economies. He directed the US$9.8 million "Making Small Farms Big Business" investment plan commissioned by the state of South Carolina in 2013. Meter has also worked with several food banks nationally to bring an economic perspective to their capacity-building work, and recently completed a national study of the economic and social-network impacts of institutional food purchasing with the Illinois Public Health Institute.*

regional economic statistics" (BEA, 2013a, p. 1). Luckily BEA's exceptionally user-friendly, interactive website persists, allowing researchers and advocates continued access to many state-level data sets.

As we wait for the publication of county-level data from the 2012 Census of Agriculture — also delayed by the fall shutdown — it becomes clear that local data itself is endangered in a political era that questions every possible public expenditure.

Indeed, the field of economics moved away from local-level data several decades ago. The penetration of the global economy was so complete, many argued, that only national-level or multination data could offer meaningful tallies. Money flowed so freely across county lines that there was little to be gained by attributing economic activity to place, this worldview asserted.

BEA was one government agency that expressed a counterpoint to that assertion. Recognizing that most economic development occurs in specific places, often shaped by local incentives, BEA doggedly provided municipal decision-makers with the tools to understand local income trends. For me, the economic data covering farm income and SNAP have served as essential tools. Data on farm income and expenses have been one of the few detailed ways to show the workings of the overall economy at the local level.

In recent years, of course, there has been an outpouring of public interest in local economies. This is integral to community-based foods initiatives. Ironically, just as local leaders ask for solid measures of local economic impacts, the essential data that could provide them has been electronically erased.

This has profound consequences for communities across the U.S. Since our choices of what to measure sometimes define which issues we address, the opportunity to shape local policy is likely to further diminish. If local data is not readily available, many national policy-makers will be tempted to think that local issues can easily be overlooked.

Ironically, just as local leaders ask for solid measures of local economic impacts, the essential data that could provide them has been electronically erased.

Ironically, ideologues who reject a federal role in favor of greater local authority have undermined the possibility of exercising local authority — and a political calculation at the White House has reinforced their worldview.

When I contacted the BEA to point out that its funding decision had dire consequences for both my professional practice and for local economic planning across the U.S., the official who responded expressed hope that funding would be restored in a saner political climate. Perhaps if researchers take it upon themselves to speak out, both to Congress and to BEA itself, these essential data sets will be restored. 

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

GLOBAL VIEWS OF LOCAL FOOD SYSTEMS

Reflections on the growing worldwide local food movement

RAMI ZURAYK

The fatal synergy of war and drought in the eastern Mediterranean

Published online March 17, 2014

Citation: Zurayk, R. (2014). The fatal synergy of war and drought in the eastern Mediterranean. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 9–13 . http://dx.doi.org/10.5304/jafscd.2014.042.013

Winter is not coming to the Fertile Crescent. No rain, no snow, no cold weather. A drought has taken hold of the land. Trees have blossomed but no one knows if they will bear fruits.

The countries affected include Syria, Jordan, Lebanon, Syria, and southern Turkey where the headwaters of the Tigris and the Euphrates are located. The region is politically unstable and the scene of many of conflicts and intrigues. Since the end of WWII it has witnessed tens of coups, large-scale invasions, and occupations, as well as wars, all of which have caused repeated displacement and exodus. These countries today host, in addition to their populations, 3 millions Palestinian and 2.5 millions Syrian refugees.

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The region is also ecologically fragile and water deficient, and is expected to suffer as climate change unfolds. In this part of the world, winters are short and wet and summers long and dry. Long-term meteorological data (1902–2010) indicates that wintertime droughts are not unusual, but their frequency appears to have increased over the past 20 years. Anthropic climate change is believed to only partly explain this phenomenon (National Oceanic and Atmospheric Administration [NOAA], 2011).

The countries concerned are in the midst of profound agrarian transformations. They have all witnessed massive rural-to-urban migration over the past 50 years as their rural economies were transformed by the global food regime. Except for Turkey, all are today net food importers. A 2011 IFPRI study (Breisinger, Zhu, Al Riffai, Nelson, Robertson, Funes, & Verner, 2011) predicted significant declines in agricultural yields accompanying climate change. This year's drought may irreversibly damage the resilience of the landscape and have far reaching consequences on agrarian communities. It may also impact countries far

beyond the political borders of the region.[1]

Each of the countries is enduring the drought in its own way. In Lebanon cumulative precipitation this year at the time of writing is at a 140-year low. It has barely reached 50 percent of the 30-year average in Beirut city. In the main agricultural region of the country, the Bekáa plain, precipitation is around 20 percent of the annual mean. This is the lowest year on record. There has been not enough snow for the winter sports stations to operate. This was devastating for the thousands of small farmers whose livelihood is diversified between tourism and agriculture. If the trend continues, there will not be sufficient soil moisture for rain-fed crops. The underground reservoirs, already overpumped, will not refill. Drinking water is in short supply in all urban centers, where basic services have been overstretched by one million refugees from the Syrian war.

Jordan took its name from the river that now runs almost dry. A *National Geographic* article published a few weeks ago asked whether the mystic river could still be saved as it dwindles, while refugees from Syria keep flowing into Jordan (Schwartzstein, 2014). If the river can be saved, it won't be by this year's rains. Precipitation so far is below 35 percent of the long-term average. This comes at a time when the country has to deal with over 600,000 Syrian refugees (UN High Commission for Refugees [UNHCR]), in addition to 1.9 millions Palestinian refugees (IRIN, 2010) and 30,000 Iraqi asylum seekers. Water shortages are expected to devastate the largely irrigated agriculture in the Ghor valley on the East bank of the River Jordan, and to have serious impacts on other sectors. The people of Jordan have been praying for rain since early February (Freij, 2014).

Turkey's farmers are concerned by the low amount of precipitation and snow the country has received this year. Snow, needed to strengthen to the wheat crop, has been absent from many regions. Rainfall has failed to meet expectations in the mountains feeding the Tigris and the Euphrates in eastern and southeastern Anatolia. The region had received 40 percent less than the long-term rainfall average (Salacan, 2014) in January, which is usually the wettest month. A decline in the flow of the rivers will pose a threat to the two downstream countries: Syria and Iraq.

Nearly half the water used in agriculture in Syria originates as surface water, mainly from the Tigris, Euphrates, and Orontes (which originates in Lebanon). Underground water from aquifers fed from the Turkish mountains form a significant part of the remaining irrigation water, especially in the farming regions of Al Hasakeh, Al Raqqa and Al Jazeerah in the northeast of the country. The drought will further damage the resilience of the people who have stayed behind, and who are not on the distribution list for food aid. The World Food Program, which already distributes rations to 3.7 million people, estimates their number to be 500,000 (More than 500,000 in Syria without food aid: WFP, 2014). These farming communities rely on whatever the land produces to survive.

The drought will further damage the resilience of the people who have stayed behind, and who are not on the distribution list for food aid. These farming communities rely on whatever the land produces to survive.

This is not the first drought in Syria in recent times. Since the beginning of the 20th century, Syria and its neighboring countries have experienced six major droughts. According to Peter Gleick (2013), a writer on climate issues, these were droughts where precipitation was less than one third of the long-term yearly average. And they may become more frequent. In a paper published in 2010, Skaf and Mathbout present their analysis of 50-year rainfall data in selected regions of the north, north central and northeastern region of Syria. They report "an increasing tendency in annual and

[1] For linkages between worldwide water security and U.S. national security see, for example, the U.S. National Intelligence report *Global Water Security*. available at http://www.dni.gov/files/documents/Newsroom/Press%20Releases/ICA_Global%20Water%20Security.pdf

seasonal drought intensity in 15 regions from North, East and Central Syria corresponding with an increasing dry days number in rainy season" (Skaf & Mathbout, 2010, p. 112).

The last drought struck between the years 2006 and 2011, just as the Bashar Assad regime opened the country and engaged in economic liberalization after decades of planned protectionist economy. After the economic opening, according to the IFPRI study cited above, Syria became a net importer of food commodities such as rice, maize, barley, and poultry.

In the poor hinterlands, such as the agricultural region of Al Hasakeh bordering the steppic rangelands, total crop failure caused by the multiyear drought affected up to 75 percent of farmers and herders. A joint UN-ACSAD study (Erian, 2011) reported that pastoralists lost around 85 percent of their flocks, which were sold at a quarter of their cost. The story was repeated in the rain-fed northeast of the country, as well as in the middle north and in the southwest. This drove millions of small farmers and rural folks into extreme food insecurity; over a million people left the countryside. A survey of drought-affected regions showed that only 10 percent of houses in villages surveyed were occupied, mostly by old people and children. While men migrated to Lebanon to seek employment, many women went to work in the packing plants of Tartous on the Syrian coast, where they suffered from chronic exploitation and abuse, leading to systemic social dislocation.

The 2006-2011 drought is widely credited by academic and mainstream writers to have catalyzed the insurrections and fed the war,[2] as the moral economy of the autocratic Baath regime collapsed without concomitant amelioration of civil and political liberties or standards of living. In true neoliberal fashion, a handful of people became richer while the masses experienced reduced access to basic commodities and services. Regime cronies increased their reach and control over farmland as subsidies were slashed. Agriculture, which accounted for 25 percent of GDP in the year 2000 and employed 40 percent of the workforce, according to the UN-ACSAD study, went into freefall, reaching 14 percent of GDP in 2010 (Al Munayyar, 2014). Disenchanted and disaffected rural residents and jobless urban refugees formed the human base of the contestation, which rapidly degenerated into violent armed confrontations. They also became the cannon fodder of the war. The estimated death toll of the Syrian war has exceeded 150,000,[3] and 2.5 millions people have been displaced. The areas that were most strongly affected by the drought were also the hotbeds of the insurrection. They are today under the domination of armed groups, some of which are linked to Al Qaeda.

Every possible effort must be deployed to prevent the collapse of Syrian agriculture. Should this happen, the impact will be irreversible and catastrophic in the long term.

The official data-collection infrastructure has been disrupted by the war. Informal reports indicate that, depending on location, rainfall could be up to 80 percent lower than last year. According to the data I was able to scrape together from news reports, the declines in the area planted in the 2012–2013 season were 83 percent for wheat and 86 percent for barley, compared to the previous season. Yield dropped by 33 percent for wheat and 14 percent for barley. The crop production share of the GDP fell by 40 percent and animal production share by 50 percent.

It may sound frivolous to raise the issue of drought and of the demise of the Syrian farm sector in the midst of a devastating war. Drought, it may seem, should be the least of our worries when there are people to protect from violence and death. There are at least three reasons why action

[2] See for example the "One-stop list of resources on Syria, drought, climate change and unrest," retrieved March 12, 2014, from http://climateandsecurity.org/2014/01/23/updated-one-stop-list-of-resources-on-syria-drought-climate-change-and-unrest/

[3] Approximate figures as the UN stopped updating the death toll of the Syrian war in January 2014.

on the drought in Syria and the region is important today: First, a state of protracted conflict imposes on relief agencies the need to identify and locate the most vulnerable groups in order to address issues of food security. Drought will obliterate the resilience of food-producing communities isolated by war. Overlaying the map of conflicts over the map of droughts will help target efforts in order to maximize the impacts of aid programs.

Second, disaster management practitioners agree that the best time to build preparedness is during a crisis, especially since the Syrian war shows no signs of receding. Research (before the war) by IFPRI showed that yield reductions due to climate change of up to 50 percent in strategic crops were to be expected by 2050 (Breisinger, Al-Riffai, & Wiebelt, 2013), with rural households set to suffer the most. With war acting as a multiplier, the worst is to be expected.

Third, every possible effort must be deployed to prevent the collapse of Syrian agriculture. Should this happen, the impact will be irreversible and catastrophic in the long term. Take Iraq for example, which was, like Syria, one of the cradles of settled agriculture. The poorly thought policies of the "modernist" Baath regime made the sector vulnerable. The two Gulf Wars, the protracted siege, and the U.S. invasion all but annihilated Iraqi agriculture. The oil-for-food program dealt the final blow to the local production systems by flooding the markets with cheap foodstuffs. Small farmers exited the system, and from being a food producer, Iraq has become a major importer of food, and its agricultural sector is wide open to exploitation by multinational corporations.

In the parched Eastern Mediterranean, climate fluctuations are chronic, and traditional farming systems are adapted and resilient. However, extreme events can wreck havoc and cause social and political instability. Environmental historians are only starting to unravel the relationship between climate and historical events. In a recent book on the subject, Sam White (2013) shows how the Celali rebellion of 1595–1610, which exhausted the Ottoman Empire and had far-reaching consequences, was in part triggered by a Little Ice Age which brought extreme cold and extreme drought to region of Turkey and Syria. Hole (2007) analyzed archeological and historic data from Al Hasakeh in Syria. He found that the region witnessed ebbs and flows of human settlements from 7000 BC till modern times, due to the combinations of wars, conquests, droughts, and unsustainable land use.

Enriched by this new knowledge, agencies must include creative approaches to sustaining farming communities across the Syrian territory in their aid operations. This will have longer-term impacts than exclusive reliance on the distribution of food rations in a region plagued by conflicts, occupations, and recurrent droughts.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

THE ECONOMIC PAMPHLETEER
JOHN IKERD

Competition versus cooperation

Published online February 4, 2014

Citation: Ikerd, J. (2014). Competition versus cooperation. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 15–17. http://dx.doi.org/10.5304/jafscd.2014.042.001

Cooperation has emerged as a new watchword of the sustainability movement. Those who are concerned about sustainability are encouraged to cooperate rather than compete. Food-related cooperatives include regional food hubs, local food networks, food box schemes, food buying clubs, farmers' markets, community supported agriculture operations (CSAs), and farmer-owned cooperatives. Cooperation is a logical response to the obvious ravages of cutthroat economic competition in the American food system. However, we cannot afford to ignore our basic human tendency to compete.

Obviously, unrestrained competition is not

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*Why did I name my column "**The Economic Pamphleteer**"? Pamphlets historically were short, thoughtfully written opinion pieces and were at the center of every revolution in western history. Current ways of economic thinking aren't working and aren't going to work in the future. Nowhere are the negative consequences more apparent than in foods, farms, and communities. I know where today's economists are coming from; I have been there. I spent the first half of my 30-year academic career as a very conventional free-market, bottom-line agricultural economist. I eventually became convinced that the economics I had been taught and was teaching wasn't good for farmers, wasn't good for rural communities, and didn't even produce food that was good for people. I have spent the 25 years since learning and teaching the principles of a new economics of sustainability. Hopefully my "pamphlets" will help spark a revolution in economic thinking.*

sustainable — in the economy, society, or nature. Contrary to popular opinion, Darwin was not referring solely to competition when he wrote about the origin and evolution of species. Individuals often need to compete for the opportunity to pass on their genes, but cooperation is necessary to actually accomplish conception and successful reproduction. Even organisms that reproduce by simple cell division must have a cooperative environment for the offspring to survive and thrive.

"Survival of the fittest" means survival of those who successfully integrate the seemingly opposite tendencies of competition and cooperation. Healthy living organisms have emergent properties that make them stronger than their individual tendencies to either cooperate or compete. For example, the human body is made stronger by its individual parts that cooperate in sustaining the physical health of the body as they compete for its energy and attention. Throughout human history, whenever cooperative social groups have formed, they have created games, rituals, and other competitive means of assessing worth. Competition is essential to our individual being, cooperation is essential to our social being, and both are essential to being fully human. Both are essential for regeneration, resilience, and reorganization, and thus both are essential for sustainability.

"Survival of the fittest" means survival of those who successfully integrate the seemingly opposite tendencies of competition and cooperation.

The emerging conflict between competition and cooperation today is reminiscent of the cooperative movement of the late 1800s and early 1900s. Cooperation was a logical defense against the merciless forces of economic competition emerging from attempts to establish a "self-regulating," global economy. Economic exploitation of the working class was rampant. In his classic book, *The Great Transformation,*[1] Karl Polanyi explains how the competitive forces of capitalism were destroying the social fabric of global society. People attempted to defend themselves by forming cooperative organizations that allowed them to meet their needs without competing.

The situation in the late 1800s and early 1900 was similar to that of the enclosure movement of the late 1700s and early 1800s. Prior to the "great transformation," as the enclosures were called by Polanyi, neither land nor labor could be bought or sold. Both had to be "commoditized" before their use could be guided by the impersonal transactions that advocates of free-market competition thought necessary for economic self-regulation. Capitalists considered government, regardless of its form, to be inherently incapable of directing the use of land and labor to meet the needs of society. They believed all such decisions should be left to the impersonal forces of competitive free markets. Adam Smith's "invisible hand" would transform individual greed into societal good. There was no recognition of either the vulnerability or value of society and nature, other than as untapped reservoirs of economic value.

The social fabric of families, communities, and societies, knitted and bound by personal relationships, were being ripped apart by the forces of impersonal economic transactions. Nineteenth-century governments were incapable of stemming the tide of free-market capitalism. It was left to people to defend themselves, which they did by forming various kinds of cooperative organizations.

As the cooperative movement grew, its various and diverse elements coalesced and became part of the Progressive political movement of the early-twentieth century. The government became a means of national defense against the social devastations of free markets. Child labor laws, labor unions, direct election of senators, women's suffrage, antitrust laws, and progressive income taxes were early battles won on behalf of society. The New Deal in the '30s brought victories for Social Security and unemployment benefits; the

[1] Polanyi, K. (1944/1957). *The great transformation: The political and economic origins of our time.* Boston: Beacon Press.

Great Society of the ’60s added civil rights protection, Medicare, and Medicaid. As government took responsibility for protecting society from competition, the cooperative movement receded, its mission seemingly accomplished. The environmental movement of the ’60s and ’70s extended government protection to nature as well as society.

However, the capitalists regrouped and fought back — with a vengeance. Runaway inflation during the ’70s and the global recession of the ’80s were labeled as inevitable consequences of government interference in markets that otherwise would be capably self-regulating. Capitalists pointed to the fall of the Soviet Union as proof that governments are inherently incapable of regulating the use of land and labor. “Government is not a solution to our problem, government is the problem.” Reaganomics marked a return to the economic fundamentalism of self-regulating markets. All restraints on the economic exploitation of land and labor, meaning nature and society, would be removed to allow free-market competition to regulate the economy. “There is no alternative,” insisted British Prime Minister Margaret Thatcher.

The recent resurgence of cooperatives is a logical response to the resurgence of unrestrained capitalism. The economic and political inequities of today surpass even those of the early 1900s. Capitalists have succeeded in making our government “intentionally dysfunctional” to limit its ability to interfere in the economy. We must reclaim our government, but we must not repeat the mistake of expecting an *impersonal* government to restore inherently *personal* social and ethical relationships. Social ethics, such as honesty, fairness, responsibility, respect, compassion, and love, evolve out of our personal connectedness to each other. Cooperation is not only a means of defense; it also is a means of realizing the fullness of life. Government is necessary to enforce the consent of the governed, but the consent “to be governed” must arise from trusting, caring cooperative relationships.

Competition is the means by which we discover our uniqueness; cooperation is the means by which we discover our connectedness.

Nor can we afford to repeat the mistake of planned economies by denying the inherent tendency of people to compete. Competition is the means by which we find our place within society by comparing ourselves to others. Through competitive self-comparisons, day by day we discover our life’s purpose. The old cliché is actually true: Constructive competition is not about winning or losing, but about discovering how well we can play the game. Competition is the means by which we discover our uniqueness; cooperation is the means by which we discover our connectedness. Competition can be constructive, however, only if we cooperate in establishing the rules and bounds within which we compete. A sustainable economy will not deny competition — but will allow competition only within bounds established and sustained by cooperation.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Land trusts and beginning farmers' access to land: Exploring the relationships in coastal California

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Submitted May 21, 2013 / Revised October 8 and December 15, 2013 / Accepted January 3, 2014 / Published online March 13, 2014

Citation: Beckett, J., & Galt, R. E. (2014). Land trusts and beginning farmers' access to land: Exploring the relationships in coastal California. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 19–35. http://dx.doi.org/10.5304/jafscd.2014.042.008

Abstract

This paper examines relationships between beginner farmers and land trusts in coastal California. Set within the context of land consolidation in agriculture and increasing land values, some beginner farmers have created innovative land tenure relationships with land trusts in order to gain access to affordable farmland. To examine the relationships between land trusts and beginning farmers, we ask: how do conservation land trusts and agricultural land trusts view their mission in relation the intersection of conservation and agriculture? Findings suggest there is a spectrum of positions that conservation and agricultural land trusts have taken in regards to the coexistence of agriculture and conservation on their land. The increasingly popular concepts found within the local food movement may be influencing a shift in the portrayal of land trust position and mission. However, differences between how land trusts act internally and how they portray themselves publicly emerged in farmer interviews. While there may be great deal of potential for land trusts to work with beginner farmers and thereby connect a new swath of the public to conservation through agriculture, both land trusts and beginner farmers need to wade carefully into relatively uncharted waters.

Keywords

beginner farmers, conservation, land access, land trusts, local food

Introduction

> It's not farmland without farmers.
> — *popular American Farmland Trust bumper sticker*

Typically adorning older and often dusty trucks, this bumper sticker's poignancy, and indeed immediate relevance, is often lost on the casual observer. But to the owner of the truck, and to an increasing number in the food and farming sector, that short phrase symbolizes a growing reality for farmland in the United States. The average age of the American farmer has increased by one year or

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more for every census period since 1978 (Allen & Harris, 2005). Currently the average age for farmers nationally and for farmers in California, the focus of this paper, are roughly the same, at 55.3 and 55 years of age, respectively (Allen & Harris, 2005; Johnson, 2008).

In response to this trend, narratives gravitate toward what appears to be a beginner farmer[1] movement riding the coattails of broad interest in the food system and its sustainability (Burros, 2009; Greene, Dimitri, Lin, McBride, Oberholtzer, & Smith, 2009; Kingsolver, 2007; Martinez et al., 2010; Pollan, 2006). This surge of interest in creating rural, and even urban, livelihoods through sustainable agriculture and community food systems is composed of people of varied backgrounds (Raftery, 2011; Stern & Nochi, 2009). "Like all farm operators, most beginning principle farm operators are White, non-Hispanic, and male. Beginning farmers, however, are more likely than established farmers to be female, non-White, or Hispanic" (Ahearn & Newton, 2009, p. 7). By choosing to farm, many forgo higher salaries and stable incomes in favor of agricultural work that more accurately matches their credos (Galt, 2013). This current group of beginning farmers may have the potential to slow or reverse the population trend of aging farmers.

This paper examines recently established relationships between beginner farmers and land trusts, which could be an important avenue for beginner farmers' access to land. Much of the literature on beginner farmers in the U.S. focuses on how new programs need to support this new generation of farmers (Baker, Duffy, & Lamberti, 2004; Kirschenmann, 2009; USDA, 2010), and a great deal of new curriculum has been developed across the country to prepare students for professions in sustainable agriculture and food systems (Galt, Clark, & Parr, 2012; Jacobsen et al., 2012; Perez, Parr, & Beckett, 2010. The national surge of interest in farming in the last decade has been hailed as a beginner farmer movement in popular literature, one that may stem the tide of aging farmers (Bradbury, von Tscharner Fleming, & Manolo, 2012; Raftery, 2011). However, critical research that investigates the sustainability, possibilities, directions, and structural underpinnings (or lack thereof) of this beginning farmer movement has been scant. Such research is necessary if we are to ascertain if this movement can create a long-term shift in the farming population, or whether it might fade as this new generation finds the monetary (and other) return of farming inadequate for their aspirations due to the important structural constraints discussed below.

We find it useful to contextualize the beginner farmer population within the broader agricultural and economic landscape. The aging farmer population is a symptom of rural depopulation connected to the rise of larger, mechanized farming operations. The last century saw a steady depopulation of the rural landscape in the U.S. (Berry, 1995; Gardner, 1974). In 1900 those employed directly in agricultural production made up 41 percent of the population, and, as is often noted, today that percentage has dwindled to 2 percent (Dimitri, Effland, & Conklin, 2005; Environmental Protection Agency [EPA], 2011). This rural depopulation has been driven by the technical changes leading to higher efficiencies per input of labor — spurred largely by competition in agriculture — as well as deliberate policy[2] aimed at

[1] The United States Department of Agriculture (USDA) defines a beginner farmer as someone who "has not operated a farm or ranch, or who has operated a farm or ranch for not more than 10 consecutive years" (Buland, 2010).

[2] In the 1960s, neoclassical economists at the Committee for Economic Development (CED), a Wall Street think tank, decided that the social allocation of labor and capital in agriculture was excessive and these labor resources could make more money if directed to other sectors of the economy (Levins, 2000; Lyson, 2004; Meter, 2012). They prompted changes in policy — the U.S. offered "public tax incentives for adopting new technology that replaced labor" (Meter, 2012, p. 3). At the same time, the grain giant Cargill was pushing to change U.S. farm policy away from the production controls that had been in place since the Great Depression and had helped keep farm incomes high even in times of overproduction, which had been plaguing U.S. agriculture for decades (Levins 2000). Cargill finally got its way in 1973 with the Nixon Administration and Secretary of Agriculture Butz, and the current subsidy program in the U.S. was born. Our "cheap food policy" is a concerted effort to boost production and keep commodity prices low, which reduces market returns to farmers while helping them with subsidies for some goods, but makes certain foods less expensive for the consuming public.

reducing the number of farmers in the U.S.

The workings of agrarian capitalism, often sped up by governmental policies, have resulted in declining returns to farms in the U.S. Net farm income — total cash receipts from selling farm products, minus production expenses used to produce them, to all farms in the country — dropped considerably, from US$50 billion in 1910 (adjusted to 1988 dollars) to US$38 billion in 1988 (Johnson, 1990, p. 5). More recently, net farm income dropped nine percent from US$46 billion in 1962 (adjusted to 2011 dollars) to US$42 billion in 2011 (Meter, 2012, p. 4). Farmers are more productive than ever, especially on a per-farmer basis, yet their overall return from the consumers' money spent on food has gone down, on both centennial and decadal scales. Since farmers often try to make a living on farm income, it is not surprising that we have fewer farmers, given that the farming population as a whole is chasing fewer and fewer potential net income dollars.

Over the last four decades the agricultural input and broader food industry, including most recently retailers, have become extraordinarily powerful in the food system, and have used this power to extract more surplus from the farm sector while giving it lower returns (Levins, 2000; Lyson, 2004). Throughout these changes, the power of these actors who squeeze farmers from both sides could have been challenged through U.S. anti-trust laws due to high levels of market concentration (Levins 2000), yet there has been little political will to do so. In all, then, declining net returns to the farm sector, and the farmer self-exploitation and farmworker exploitation that occurs within it, is largely deliberate, a set of choices made at the level of U.S. policy.

As is often the case, public discussion largely ignores these structural and social trends facing agriculture, instead framing "the problem" as an aging farm population, rather than seeing it as a symptom of these larger issues. We need new farmers, but throwing beginner farmers into the U.S. agricultural system, where the deck is stacked against farmers, especially small farmers, and pretending that it is a system in which they can thrive if they just work hard and smart enough, is not fair. Research on beginning farmers needs to keep these constraints in mind since they have important implications for beginning farmers.

One manifestation of these structural constraints is that the beginner farmer population is having difficulty accessing affordable farmland (Ahearn & Newton, 2009; Gillespie & Johnson, 2010). This means that subsidized access to land — at a level below going market value — is important for many beginner farmers since returns to farms are often quite low, they often have little capital and equity in their farms, and many are trying to farm near urban areas where land prices are high. Having an economy where goods sold by the agricultural sector are consistently undervalued relative to other sectors of the economy contributes to the economic returns to land from agriculture being much less than "developed" uses (housing, shopping malls, etc.). The higher potential returns from these non-agricultural uses are rolled into land values around urban areas (Chicoine, 1981; Livanis, Moss, & Breneman, 2006). This makes farming on the fringe more expensive, even though from a planning perspective it makes a great deal of sense for farms to exist near urban areas in terms of social engagement in agricultural literacy, as well as environmental benefits such as undeveloped watersheds and wildlife habitat (Unger & Lyddan, 2011) and reduced emissions from transportation that contribute to climate change and urban air pollution (Brillinger, Merrill, & Lyddan, 2013). Across larger scales, regional land values and land losses to development are very high in areas where settlement and urban development is in high demand. Every year, California loses 40,000 acres (16,187 hectares) of farmland to the spread of urban, suburban, and exurban areas (Thompson, 2009). In these regions of high demand, buying farmland can be prohibitively expensive for farmers, especially beginning

In the language of economists this is "a classic case of public intervention magnifying market failure" (Meter, 2012, p. 4). In short, "our public policy has been to remove the farm labor force under the guise of economic efficiency. As the CED had hoped, both labor and capital were extracted from the U.S. farm economy (CED, 1974)" (Meter, 2012, p. 3). For Berry (1977), this is part of the larger picture that is the *Unsettling of America.*

farmers who might have very little money saved. Renting is a possibility, but without a proven track record, many landlords are hesitant to rent to beginner farmers. Renting also means farmers generally lack long-term land tenure, making it difficult for them to plan for the future.

One area where high land values, pressures from development, and a burgeoning crop of beginner farmers collide is the Central Coast of California, which is our geographic focus here. With its numerous farmer incubator programs, local food movement with 1960s countercultural roots, and accommodating year-round growing season, the Central Coast has become a hub for the beginner farmer movement, supported in large part by the growth in organic and local agriculture in the region (Guthman, 2004). However, the prospect of buying land in the Central Coast, and indeed in the rest of coastal California, is beyond the capacity of all but a few beginning farming operations. Reggie Knox, a long-time beginner farmer advocate with California Farmlink, suggested that most beginning farmers struggle to find land that includes the housing and basic infrastructure necessary to create a profitable business. With agricultural land values "substantially higher…than those in the rest of the country" (Guthman, 2004, p. 84) and situated at the forefront of the beginner farmer and local food movements, beginner farmers in the Central Coast provide an example of what beginner farmers face in locales with high land values.

Below we focus on the provisioning of land to beginning farmers through the channel of land trusts in California. With their conservation mandate, land trusts may hold a great deal of potential for meeting the land needs of the beginner farmer population, especially in areas where land values are high, such as the West and East coasts. Through interviews with the staff of land trusts and beginner farmers who access their land, we examine the extent to which land trusts operating on the California coast are using their conservation mandate to protect farmland, the extent to which their protection encourages agricultural use of the land, and the ways in which they interact with the beginning farmer population.

Land Trusts as Land Managers

In order to access land, many beginning farmers have begun to pursue alternative land-tenure agreements with nontraditional landlords who appreciate the environmental and social goods that new, especially small-scale, direct market–oriented, organic farming operations promise. Popular news media have made much of farmers who have taken over abandoned lots in cities (Baume, 2012), leased from hospitals (Grobe, 2009), and farmed in state parks (Spencer & Kaplan, 2010). In addition to these and other routes of land access, beginner farmers have also made agreements with land trusts. Here we focus exclusively on beginner farmer relationships with land trusts in California.

The application of trust principles to land has a long history, and the presence of land trusts in the US is immense.[3] Land trusts are private land-management entities. In California, land trusts are vested by the state with the authority to enact some of the land conservation responsibilities of the state under the California public resource code. According to the website of the California Council of Land Trusts, land trusts in California "share a common vision for protecting the best of California — natural areas, farmlands, parks, and clean water and air" California Council of Land Trusts, 2010, para. 1). As nonprofit, 501(c)(3) tax-exempt entities, land trusts are responsible for conserving land either through fee simple ownership[4] or

[3] "Currently, about 145 million acres [58,679,400 hectares] of land granted for schools or similar institutional purposes are managed under a trust mandate by 22 states [which] puts the state trust approach to property squarely into the family of major public land ownership and management regimes: the much discussed National Park Service manages a mere 80 million acres [32,374,850 hectares]" (Souder & Fairfax, 2000). Ballot measures for allocating public funding for managing these lands have passed in nearly all 50 states from 1988 to 2005, and "[t]hese ballot measures have led to the allocation of [US]$42.6 billion of public funds to protect natural areas and farmland [through land trusts]" (The Trust for Public Land, 2006, cited in Morris, 2008). This has helped to reinforce the notion that "[t]he system of public ownership and management of land held in trust is arguably the oldest of all federal programs, and it is the most durable national approach to public resource ownership" (Souder & Fairfax 2000, p. 89).

[4] Fee simple ownership refers to those lands that land trusts own outright, either through purchase or gift. Purchases of fee titles are supported either by the land trusts membership,

conservation easements[5] on properties. In California, the state with the largest number of private land trusts (Morris, 2008), land trusts manage over 200,000 acres (80,937 hectares) of farmland (Thompson, 2009). Thus there is a possible confluence of interests between conservation and agriculture in California that might make land trusts important actors in supporting beginner farmers in the state.

Land trusts are part of what Salamon (2002) terms the "new governance." In the new governance, the outsourced management of state responsibility is supposed to trim the size of the state, reduce the burden of mission enactment, and save money.[6] However, around land trusts specifically, some have argued that "removing regulatory power from public to private jeopardizes democratic land-use planning" (Johnson, 2008, p. 23) and may "tend to ignore the interconnectivity of landscapes and the important public interest in the ecological values housed on private lands" (Morris, 2008, pg. 1223). Supporters of this new type of governance argue that any loss of democratic governance is overruled by the monetary gain. By vesting responsibility in nonprofit organizations supported by grant funding and dues-paying members, they argue, the state spends less for the same conservation outcomes. Supporters also claim that local land trusts have the advantage of familiarity with the local area, have greater success at negotiating transactions below fair market value, and may better work with farmers since many farmers may prefer not to deal with government agencies (Coppock & Ames, 1989).

Primary goals of land trusts in California, according to the California Council of Land Trusts, include protecting farmscapes, working lands, and rural livelihoods. Though they share these and other common broad goals, there are essentially two major categories of land trusts: "conservation land trusts" that are conservation-oriented, with a focus on preserving land for open space and habitat protection,[7] and "agricultural land trusts" that focus on the preservation of land for agriculture (Merenlender, Huntsinger, Guthey, & Fairfax, 2004). Both use the same long-term techniques to acquire and protect land, which most often are fee simple acquisitions and conservation easements (Coppock & Ames,1989).

In order to carry out their missions, land trusts are supported by the public in many ways in California. The public, through the state, vests the power to conserve land in land trusts. The public supports these measures by allowing land trusts to enjoy a tax-exempt, nonprofit status, Williamson Act privileges,[8] and monies from public bond measures, propositions, easement subsidies, as well as grants from state agencies such as the Coastal Commission and the Department of Conservation. As nonprofit charitable organizations, most land trusts also enjoy a "welfare exemption" on their fee simple properties, which means they are exempt from paying California property tax, except in cases when they benefit economically from the property[9] (Endicott, 1993).

To examine the relationships between land

grants, gifts, or by state funding through bond measure and propositions.

[5] Conservation easements restrict the development and use of a particular property through the creation of a secondary title or "easement" on a property. They are voluntary agreements placed on property by private owners. The easements are either sold or gifted to land trusts and remain with the parcel of land in perpetuity, regardless of whether the land ownership changes hands. The land trust as easement holder then is responsible for the enforcement of the conservation plan put forth by the easement. Private landowners can enjoy a range of benefits that act as incentives to create easements. For example, if the easement restrictions lower the fair market value of the property (which is most often the case), in many states the owner will pay a lower property tax in line with the reduced market value.

[6] This is prime example of Peck and Tickell's (2002) "roll-out" neoliberalism (Morris, 2008).

[7] Land trusts have had a long history of identifying with the conservation movement that birthed the national park system and the Sierra Club (Brewer, 2003).

[8] The Williamson Act, or the California Land Conservation Act of 1965, is a tax relief program that lowers property taxes on agricultural and open space land if owners agree not to develop the land for 10 years. Enrolling land under the Williamson Act is considered a short-term voluntary act of preservation and greatly augments the land held in conservation by private, nonprofit, and state entities.

[9] Welfare exemptions can be given to any nonprofit organization that is organized for religious, charitable, hospital, or scientific ends. They were authorized by section 214 of the California Revenue and Taxation Code in 1944.

trusts and beginning farmers, we ask: how do conservation land trusts and agricultural land trusts view their mission in relation to conservation and agriculture, including the role that agriculture plays in conservation? Is this changing with an invigorated public discourse around community food systems? And how do the experiences of beginner farmers working with land trusts in the Central Coast of California articulate with land trusts' messages about the possibility for agriculture and conservation to be mutually beneficial? Answering these questions will help demonstrate land trusts' potential role in helping a new generation of farmers be successful.

Study Site and Methods

The research reported in this paper began with consultations conducted during 2010–2011 with farming and land conservation stakeholders in California's Central Coast counties of Santa Cruz, San Mateo, San Benito, and Monterey. Interviews were used to elicit possible avenues of research that would be of use to this community. The results of these consultations revealed a rift between beginner farmers and land trusts in relation to their respective ideas around land use and access. It was the investigation of this rift that inspired the research on which this paper is based. From these initial conversations the research questions stated above were developed.

The data in this study come from samples of two primary populations: staff from land trusts operating throughout coastal California (from Humboldt County to San Diego County), and a group of beginning farmers working with land trusts in the Central Coast (Monterey, Santa Cruz, San Mateo, San Benito Counties). We chose to interview land trusts throughout coastal California to understand the population as a whole, and to see if the location of the land trust affected the staffs' perspective of agriculture (though this is not the focus of our analysis below). Only beginner farmers in the Central Coast were interviewed since there were no land trusts north of Marin County or south of San Luis Obispo County that were working with beginner farmers. Land trusts working with beginning farmers were most common in Monterey, Santa Cruz, and San Mateo counties, where the interviews with beginning farmers were conducted.

A list of 28 land trusts operating in coastal California was gathered from the website of the California Council of Land Trusts, and each of these land trusts was contacted.[10] Of the initial 28 land trusts assumed to be in operation in the coastal counties of California, 20 responded. Of these, four chose not to participate (most cited staff time restrictions), and thus the total sample size of land trusts for the study is 16. Of these 16 land trusts, two were agricultural land trusts, organizations with missions focused on the protection of agricultural land through land conservation. The other 14 were conservation land trusts, with missions more focused on nature preservation. In the fall of 2010 and spring of 2011 phone interviews were conducted with conservation managers, assistant directors, and/or executive directors of 15 land trusts; one interview was held in person.[11] In one case, two interviews were held with personnel from one land trust; this is explained at length further on in the paper. During the land trust interviews, notes were transcribed on a computer.

We followed the USDA definition of a beginner farmer as someone who "has not operated a farm or ranch, or who has operated a farm or ranch for not more than 10 consecutive years" (Buland, 2010). The population of beginning farmers accessing land through land trusts was sampled using a snowball approach, beginning with the suggestions of the stakeholder community in the four Central Coast counties that helped shape the research questions, and branching outward. Land trust employees we interviewed also suggested farmers to contact for interviews. Seven beginner farmers[12] were interviewed in person

[10] All were contacted in November 2010 with a personalized email. If there was no response by January 2011, they were contacted by email again. If there was no response via email by February 2011, their office was contacted via phone.

[11] One out-of-state land trust was also contacted and interviewed to give a national perspective on land trust attitudes and perspectives. These data were not included in this analysis.

[12] In hindsight, interviewing a group of more advanced farmers in addition to this beginner farmer population would have given us more context to understand the specific qualms of the beginner farmer population in relation to land trusts.

between November 2010 and March 2011. This sample of seven beginning farmers is out of a total population of 10 beginner farmers who were actively leasing from land trusts in Monterey, Santa Cruz, San Mateo, and San Benito counties during this period. The beginner farmers interviewed were all currently leasing land from land trusts or had leased land from land trusts within the past two growing seasons. Of the seven interviewees, four held additional leases on privately owned land. All interviews were recorded and subsequently transcribed.

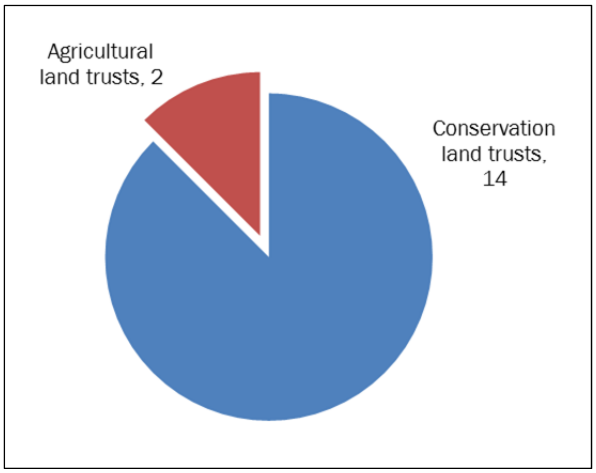
The practice of grounded theory was central to the conception, execution, and analysis of this project. In keeping with grounded theory, according to Corbin and Strauss (1990), "the analysis [began] as soon as the first bit of data [was] collected" (p. 6. The interviews with stakeholders influenced the formulation of the questions that we would later ask the interviewees. Using concepts as the basic units of analysis, we coded data from transcriptions and notes from both land trusts and beginner farmers. During coding, we noted common themes, patterns, and deviations. Coding for the land trust interviews focused on the ways in which land trust employees specified their mission and goals, especially vis-à-vis the relationships between agriculture and conservation. Coding for the beginner farmer interviews focused on their working history, perception of land trust position and the public portrayal of their missions, and views of their land leases and the land trust's management as landlords.

Findings

Land Trust Orientations Toward Conservation and Agriculture

Land trusts in the sample varied significantly in the amount and type of land they managed. The smallest land trust surveyed oversaw 300 acres (121 hectares), and the largest ones managed acreage in the tens of thousands. As previously mentioned, there were two major categories of land trusts in the sample; the principle category we call "conservation land trusts," that is, land trusts that preserve land more generally for open space and natural resource conservation (n=14), and

Figure 1. Number of Conservation Land Trusts and Agricultural Land Trusts in This Study



"agricultural land trusts" that are specifically oriented toward the preservation of land for agriculture (n=2) (figure 1). At the time of this paper, there were 173 land trusts in total in California, and of those, 15 were specifically agricultural land trusts. Agricultural land trusts were defined in the research as organizations that explicitly sought to preserve active *farming* rather than merely farmland. Conservation land trusts in the study often sought to preserve *farmland* but in no cases specified having active farming businesses as their end goal. Both types of land trusts were represented in the study and will be distinguished by type in the analysis.

As demonstrated in table 1, a large portion (10 out of 16) of the land trusts interviewed manage some form of agricultural land. Of these 10, eight are conservation land trusts. The other two land trusts that manage agricultural land are agricultural land trusts. Regardless of the type of land trust and exactly how much agricultural land the organization managed, every organization's staff had a position about agriculture and how it should or should not be integrated into the conservation mission of their particular land trust. The central interview question used to distinguish these values was, "What are the benefits and costs of agricultural agreements to your land trust?" The diversity and frequency of response are illustrated below in figure 2. Eight conservation land trusts and both agricultural land trusts answered this

question and are included in the analysis below.

Through coding the responses, we identified six primary themes for land trusts' answers to this question: agriculture is detrimental to conservation, rural livelihoods and family farmers are important, farmers should be valued as stewards of nature, agroecological conservation is a primary focus, green jobs are key, and local food systems are important. Each of the eight conservation land trusts that answered the question responded with one definitive answer, with the exception of two organizations who gave more nuanced responses. One of these land trusts was remarkable as the two interviewees gave nearly opposite responses to the same question.[13] In contrast to the relatively simple answers of the conservation land trusts, the two agricultural land trusts that answered this question each had complex responses that drew on three different themes, showing even greater nuance to how their organization viewed agriculture and conservation. These organizations' perspectives are shown graphically in figure 2.

Table 1. Number of Acres Managed by Land Trusts Interviewed [a]

	Land in any use			Land in agriculture		
Land trust	Fee simple	Easement	Total	Fee simple	Easement	Total
A	131	12,000	12,131	100%	100%	12,131
B	1,300	0	1,300	50%	—	650
C	—*	—	—	—	—	—
D	100	200	300	0.2%	—	6
E	2,600	3,600	5,200	2%	4%	312
F	—	—	—	—	—	—
G	0	5,000	5,000	—	—	—
H	0	22,000	22,000	0%	80%	17,600
I	5,000	12,000	17,000	100%	100%	17,000
J	12,500	2,500	15,000	15%	85%	15,000
K	—	—	—	—	-	-
L	0	42,000	42,000	—	100%	42,000
M	1,600	120	1,720	100%	100%	1,720
N	—	—	—	—	—	—
O	3,200	1,600	4,800	90%	90%	4,320
P	—	—	—	—	—	—
Average	2,403	9,184	11,496	37%	44%	11,074

* – = no data were given by interviewees.

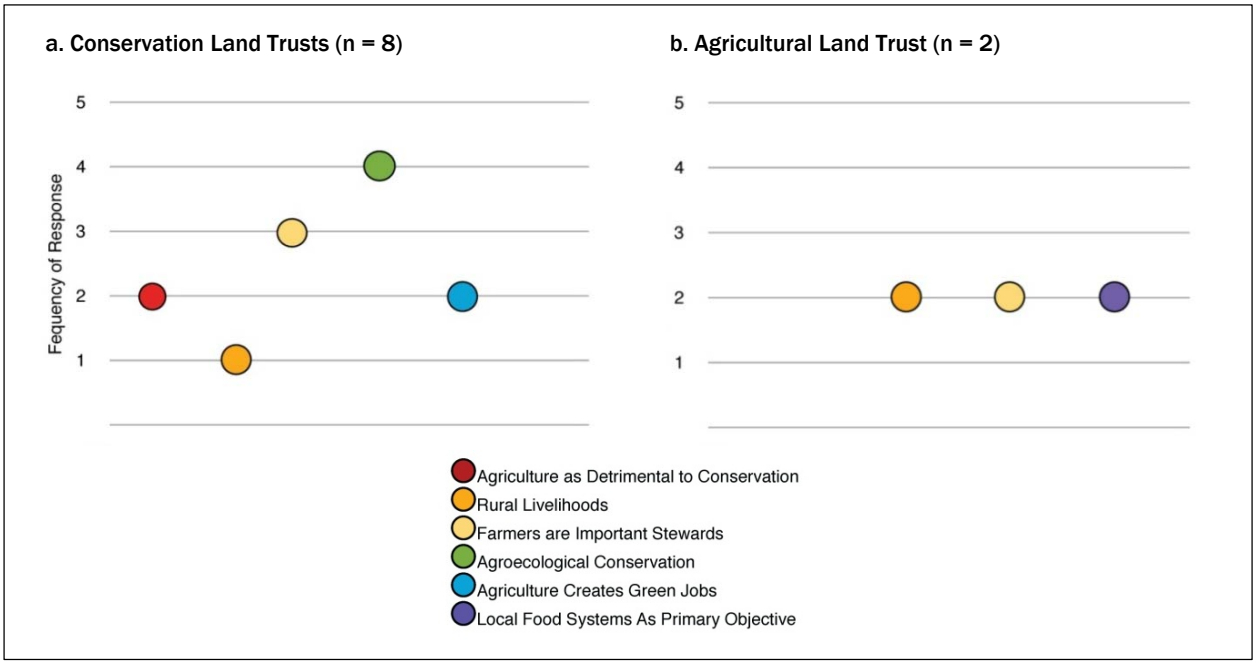
[a] Because the land trust community is rather small and intimate and confidentiality was promised, this table excludes identifying information of which organizations operate in the Central Coast, which organizations are agricultural land trusts, and other details. For the same reason in subsequent sections we do not reveal key characteristics of land trusts that could allow them to be identified.

That agriculture is detrimental to conservation was the stance of two conservation land trusts' staff who saw no room for the coexistence of agriculture and conservation within their organization. One of these land trusts was located close to an urban metropolis, and the staff from this land trust stated, "We wouldn't seek to preserve or encourage agriculture. We want to preserve habitat for rare species." The staff member who responded for the other land trust felt similarly, although this was a conservation land trust that managed many agricultural parcels via fee simple arrangements and easements. This staff member responded in confidence that any of the organization's public moves to appear to support agriculture was "lip service." He stated that "the organization wants to look like they are preserving agriculture so that people will give to them and allow them to get more open space."

Responses related to valuing rural livelihoods and farmers as important stewards came from the two agricultural land trusts and three conservation land trusts. The agricultural land trusts felt that rural livelihoods and family farmers were both part of supporting a functioning agricultural economy and therefore landscape. The conservation land trusts felt that rural livelihoods and family farmers were part of supporting good conservation. One

[13] At this conservation land trust, there were two people interviewed, and they held divergent opinions about how their land trust operated. In all other cases of conservation land trusts in which multiple employees were interviewed, staff identified the missions and values similarly.

Figure 2. Land Trust Identity in Terms of Agriculture and Conservation



conservation land trust's staff felt so strongly about rural livelihoods and family farmers that they answered that both were central to their organization. This conservation land trust, though focused primarily on native habitat restoration, was proactively working with family ranches that had conservation easements on their farms in order to encourage conservation practices by ranching operations.[14]

Four conservation land trusts answered that agroecological conservation was important to their organization, and that they valued proactive agricultural management that achieved ecological conservation goals. The two conservation land trusts that spoke of green jobs had land that bordered and were headquartered on the urban periphery, and were referring to urban jobs in agriculture, rather than rural livelihoods. The agricultural land trusts were the only two organizations that spoke of the priority of local food systems as being central to conservation and to their mission. The staff of both spoke to the idea that environmentally responsible food production was more important than traditional natural resource conservation. As one might expect, the two agricultural land trusts went on to talk about the multiple benefits of agricultural agreements to their land trust, although both of these institutions stressed the need to integrate agriculture and conservation.

That conservation and agriculture need to be integrated was a views held by many of the land trust staff interviewed. Staff at Land Trust 2 (a conservation land trust) expressed that their land trust viewed "'working landscapes' as an essential part of conservation," and that their board strongly held that the best way to "get the environmental benefits [on the land is] when you've taken care of the first two parts of [the] sustainability [of the farmer], i.e., social and economic." This respondent continued: "Many of these people have been here for generations. We are just trying to make it possible for these people to continue to be viable and healthy as producers." This belief translates directly into the actions of that land trust. By the account of the land trust staff and local newspaper articles, this organization had stable, long-term relationships with experienced farmers and had

[14] This conservation land trust was not considered an agricultural land trust because in no way did the mission of the organization specify the preservation of agriculture.

started to collaborate successfully with several beginner farmer operations through one- to five-year leases. They were one of three conservation land trusts that directly identified the idea of effective conservation being directly dependent upon their relationships with farmers.

As represented on in the local food system category of figure 2, other land trusts described themselves as strictly agricultural preservation organizations. One executive director candidly confided that, "to be perfectly honest, [our] board is just really not that concerned with nature, the preservation of agriculture is the focus." The types of agriculture that this land trust supported was not relevant to their mission, as long as the farming was economically viable for the farmers. Thus, this land trust had little environmental restriction on the farming operations on their easement land, and, while speaking to the idea of the importance of local food production and the preservation of agricultural land for active farming, it did not engage in a critique of what could be considered environmental disregard by some types of farming operations. Here we witnessed a split between the two agricultural land trusts and within the local food system category. The other agricultural land trust was actively working to restrict destructive environmental practices of the farming operations using their land in order to uphold their tenets of conservation.

Changing Orientations: Valuing the Role of Agriculture in Conservation?

Although the spread of views was wide, exactly half of the conservation land trusts that took part in this study spoke to the fact that their organization was making more of an effort to be involved in agriculture. The interviews suggest that conservation-focused land trusts are in the process of identifying with the growing public discourse around local food. The valuation of these ideas likely arises from the growing food movement highlighted in the introduction. Land trust identification with this discourse came in a variety of forms. First, small blurbs about "working landscapes" and language around supporting family farms appear on their websites, and in speaking with their staff informally at the start of the research they noted interest in supporting more beginner farmers. Second, when setting up the interviews, many of the conservation land trusts would respond to the request to speak about their agricultural and beginner farmer policies with an answer along the lines of, "I'm so glad you called, we've been discussing this lately with our board and are definitely looking for guidance on the matter." These land trusts' staff stressed that they were interested in seeing the results of the study to further inform their development along these lines.

Third, land trusts of all kinds noted their commitments to agriculture and local food during the interviews. For example, one conservation land trust's manager stressed how committed they were by stating, "We are very focused on local. The way we reach out to people is local, healthy food."[15] An easement manager of an agricultural land trust said, along the same lines, "local food" was an important part of their position, specifying that, "we put it out there in our newsletter. We have a local production [and local foods] section of our newsletter. We have specific fundraising around that." These same two land trusts cumulatively manage approximately 70 percent of agricultural acreage of the sample population, and judging by their support base, how many agricultural acres they manage, and how many farmers they currently work with, both have been very successful in helping support farms through land access while simultaneously leveraging grant, foundation, and donor valuation of the local food systems discourse. Echoing the sentiment that land trusts benefit from their relationship with these farmers, one beginner farmer described that, as landlords, land trusts

> are pretty straight forward, they don't require much, and they don't give much either… [but] we make them look really freakin' good. We make them look really good. They slap our name and face around [on their promotional materials], they have donor events

[15] This land trust, although the stressed local food, was by it's mission a conservation land trust. Their mission emphasized the conservation of farmland, but not the preservation of an active farm economy.

> here, they have us to their little donor wing dings, wine and cheese events, we make them look really good. [Farmer 2, speaking of one of the land trusts interviewed]

But it was also evident that land trust staff held substantially different positions about the sincerity of land trusts' commitment to agriculture and local food systems. For example, when two personnel (who had varying levels of seniority) from the land trust that Farmer 2 is speaking of above were interviewed, the lower-level conservation land manager from that organization described that their land trust was only interested in conservation, not agriculture, even though they lease to farmers. This stood in stark contrast to a subsequent interview with an upper-management employee who described the values of the land trust as realizing the value of agriculture that works in harmony with conservation. In three cases in our research there was a similar disconnect in the pro-agriculture message of upper-management answers compared to the story told by either their staff or the farmers who worked with those land trusts. This suggests that there are some conservation land trusts that make false claims, or at least engage in stretching the truth, when it comes to their agricultural priorities. Supporting this disconnect between rhetoric and practice, a chief financial officer of a national land trust said of conservation land trusts that, "[My] guess is that 80 percent of the land trusts that tip to agriculture do so for landowner friendly fundraising."

There are several land trusts in coastal California that are developing, and indeed selling, this discourse of local food, and some may be doing so without aligning their internal practices with their publicly expressed sentiments. As expressed in the interviews, some of these land trusts still identify privately with a discourse of agriculture being detrimental to conservation. Beginning farmers reported experiencing first-hand the connection, or the disjunction, between land trusts' rhetoric and practice. We now turn to farmers' experiences to examine this.

Beginner Farmers' Experiences with Land Trusts as Landlords and Land Managers

> [Land trusts] have really shaped what agriculture has looked like in a negative way. And that [means] there's less ranches, less farms, less family farmers that are able to live and work on the land. It seems like they just want all the people out. Want to drive along and not see any people, not see any houses. And that's just not what farming looks like.
>
> — *Farmer 3, long-time lease-holder with conservation land trust in the sample*

The seven beginner farmers in the study sample were between 25 and 40 years of age, of White, Asian/White, Hispanic/White, and Hispanic backgrounds. There were four males and three females. Five had a bachelor's degree and one had a master's degree. Three had small farms of less than 10 acres (4 hectares). All these farmers were selling their goods through a mix of wholesale and direct marketing, two ran community supported agriculture (CSA) programs, and all of them sold at farmers' markets. Two of the operations were certified organic. All the farmers had created independent relationships with the land trusts, approaching the land trusts first about land they were interested in farming. In all of theses cases, the farmers were leasing from conservation land trusts.

All farmers interviewed were currently in one- to three-year lease arrangements with land trusts, renting land encumbered with conservation easements. Some of this land was owned fee simple by a third-party landowner, and other land was owned fee simple by land trusts themselves. While we initially believed that the conservation easements themselves would restrict farmers' ability to property manage the land (such as where a farmer could cultivate, or the ability of the operation to source water on their land) this was rarely the case. These farmers, all using agroecological methods, were not bothered by the restrictions imposed by the conservation easements' plans. In one case, however, the farmer would have liked to build a barn and was not able to within the easement restrictions.

While land trusts are attempting to figure out

how to define their commitment to agriculture and local food, farmers who lease from conservation land trusts appear to be dealing with landlords who may not understand nor support them particularly well. The four farmers currently working with conservation land trusts reported frustrations including the short-term length of lease agreements, the land trusts' neglect of farm infrastructure, and their landlord leasing other farmland to agribusiness companies that clearly were not prioritizing conservation in terms of environmentally friendly agricultural practices. These complaints influenced whether the beginner farmers interviewed questioned the commitment of conservation land trusts to agriculture.

One unifying element of this dissatisfaction was that all the farmers feel that they are exalted when convenient for fundraising efforts and then subsequently ignored or mistreated. One rancher, who described being paraded about in a "dog and pony show" at donor events, described in the same breath that

> the president has not even so much as come up and shooken our hands, when [they come] here, [they stay] in the vehicle. [They don't] even get out and say hello to us, [they don't] look us in the eye. But our millionaire friends, [they go] and [have] lunch with and talks about [their] plans. But to us it's totally secretive — we're blue collar. We're not going to give [them] any money, so we really don't matter is the feeling we get. [Farmer 3, long-time lease-holder with conservation land trust in the sample]

In the interviews, five of seven spoke of their frustration that land trusts in their area do not regularly advertise the availability of the land they manage that could potentially be used for agriculture. One rancher, who had met with several conservation land trusts in the Central Coast and was consistently denied leases on available land, exasperatedly commented that, "I've never ever seen a land trust put an RFP [request for proposal] out, ever. For a new contract, ever. If you find one, let me know. But as far as I can tell, they…all rent to large agribusiness companies." This lack of an open bidding process for access to land was disconcerting for beginning farmers who felt that their type of agriculture merged well with conservation.

Five of the seven farmers also expressed the sentiment that land trusts used the discourse of local food to get money and land from supporters, then turned around and leased that land to the highest agricultural bidder in order to subsidize their true interest: conservation of non-agricultural land. The same rancher who was concerned about land trusts renting to large agribusiness companies noted that in her experience in the Central Coast, she had heard many land trusts justify renting land trust land for conventional strawberry production because a company like "Driscoll's [a large-scale conventional and organic berry farming operation] has the capacity and the resources to really invest in this property and to do good conservation practices." Questioning how conventional strawberry production fits into the land trusts mission of conservation, the rancher commented,

> No matter how you lay out those plastic beds, they are still plastic beds, right? Still cause erosion, and run off, and prevent the filtration of the water, and all that, and it's plasticulture, filling up all of our landfills and [expletive deleted]. So what's the [conservation] value in that? Well, they earn a lot of money, they probably get paid [US]$1,800-2,000 an acre, that's a big chunk of change. And they say they are using all of that money for stewardship of that property, so it's sustainable in that way — financially. (Farmer 1, three year lease-holder with conservation land trust in the sample)

From the perspective of most of the beginner farmers interviewed, there was a noticeable gap between the values that land trusts communicate publicly and the lack of substantiation in their relationships with beginning farmers. All the farmers in this study expressed sentiments that land trusts in the area need to adapt to the changing public sentiment around conservation and agriculture to support local food systems. This led one farmer to question the valuation and support given to land

trusts by the public. "I just wonder about the *public value*. I wonder about these taxpayer dollars for these properties." When this farmer asked staff of local land trusts how they justify that public money being spent, the staff replied, "Oh, it's to stem the tide, to prevent pavement," and her outraged response was, "Can we go further than that? OK guys, that's like the old story, prevent sprawl..." These responses suggest that beginning farmers felt that the kind of agriculture they practice is the kind now highly valued in public discourse, and warrants more support. Only one land trust acknowledged any need for public accountability in regard to its mission. Specifically, the interviewee mentioned that "for us to maintain our nonprofit status we have to serve the community that we're in." Yet, it is not entirely clear what kinds of priorities and practices are needed in the context of changing discourse around agriculture and conservation.

In short, the central tension identified in the farmer surveys is that the beginning farmers felt that if a land trust truly identifies with the discourse of local food and supports local food system development through its actions, the land trust should be very much supportive of the farmers in their rental agreements. But more often than not, Central Coast beginning farmers reported experiencing false pretense.

More research is needed to examine the extent to which the views of increased compatibility of environmental conservation and agriculture that conservation land trust staff discussed in the interviews are translated into these land trusts' actions. Indeed, there appear to be land trusts that are changing their rhetoric *and* practices, and others, as discussed by the farmers in our interviews, that have a rhetorical commitment to community food systems without much of a change in their practices. An additional explanation, which can refute or coexist with farmers' explanations of conservation land trusts using the discourse of local food to expand their real conservation-without-people missions, is that many conservation land trusts are grappling with a new role: being landlords. All of the farmers interviewed had held leases with these land trusts for under 10 years at the time of interview, and these were among the first agricultural leases that any of these conservation land trusts had ever managed. The agribusiness Driscoll's that one beginner farmer complained about was leasing substantially more land and had worked with that land trust for many years. This example leads us to believe it is possible that over many years the frictions inherent in a landlord-tenant relationship could be worked out. Thus in addition to questions of intent, there are questions about whether conservation land trusts currently have the expertise to adequately supervise agricultural leases, and about the kinds of learning and resources that would be useful for better accommodating farmer tenants. Of course, learning to become better landlords requires a genuine intent to support beginning farmers, which for many of the farmers interviewed appears to be lacking. But there remains the possibility that in time conservation land trusts could become open to new priorities and could learn how to better blend their conservation values with the genuine and effective support of beginning farmers.

Conclusion

In this paper we examined how land trusts in coastal California identify with conservation and agriculture by focusing on the key elements of, and tensions in, their current relationships with beginner farmers. We found that conservation land trusts' identities in particular appear to be adapting to changing discourses around nature, food, and conservation. Some conservation land trusts have taken the popular food movement as a cue to engage newly emerging agricultural forms, and are adapting by shifting their board membership, mission statements, and, in some cases, practices to meet and support that transition. Yet some land trust staff members and beginning farmers also noted instances in which conservation land trusts publicly state their support for beginner farmers and the creation of local food systems to capture more resources for their conservation missions, yet do not follow through on their support of beginner farmers. Beginner farmers interviewed report feeling taken advantage of in these relationships.

We want to conclude on two main points. First, there appears to be a great deal of potential for land trusts to connect a new swath of the public to conservation through agriculture and the food

system, but making these connections work well for everyone appears challenging. Several of the land trusts noted in the interviews that their organizations were struggling with how to stay relevant and financially viable in an increasingly urbanized nation, where much of the population does not live in a location where intimate connection with the natural world is possible. To maintain the conservation movement in this context, figuring out how to connect with urban populations will likely be important. A recent *Time* magazine article entitled "Foodies Can Eclipse (and Save) the Green Movement" noted the possibility that if the local food movement "continues to grow it may be able to create just the sort of political and social transformation that environmentalists have failed to achieve in recent years" (Walsh, 2011, para. 2. This echoes a long-standing argument made by academics about the importance of merging conservation, livelihoods, and agriculture (e.g., Zimmerer, 2006). The food movement and its proponents have been relatively successful at connecting an urban population with environmental issues. By making environmental issues relevant and personal, the food movement has had some success in putting environmental issues and environmental politics on the proverbial American table. This connects with Souder and Fairfax's (2000) argument that the public should take a greater interest in the management philosophies of land trusts. It is only through democratic processes that that the public can re-engage fully with public goods held in trust, to make sure that the publically sanctioned tools that exist (such as conservation easements) genuinely benefit public interests. In order for land trusts to truly represent and follow popular consciousness and understanding, there needs to be more public dialogue around land use policies and the role of land trusts in managing public goods. It is important to hear through public forums about the desired connections between conservation land trusts and the local food movement.

Authentically connecting to the local food movement, and beginner farmers as a subset of it, offers potential for land trusts to reconnect with the historical national sentiment of populist agricultural preservation, and to connect with a new generation of American foodies. Though limited in scope and scale, our study identifies some of the potential difficulties of these new relationships, especially around land trusts as landlords. While there is much potential for benefits on both sides, both parties should be cautious when approaching access to land through these arrangements. We believe that for a positive outcome, it is critical that the parties involved have frank discussion about their own values and goals, and identify shared interests that can be focused on.

Our last point is around whether the large numbers of beginner farmers will succeed in creating the next generation of farmers. Innovation in land access will be critical if beginner farmers are to enter the agricultural sector and reverse the trend of increasing average farmer age. Land trusts can be a key part of increasing access, but the 145 million acres (58,679,400 hectares) of land in their care is small relative to the one billion acres (404,685,644 hectares) that are currently in active cultivation and ranching in the US today (USDA, 2013), and the structural ills of American agrarian capitalism are far deeper and broader than access to land offered by land trusts. Thus it is likely that beginner farmers will need to figure out how to access more land than what land trusts can currently offer. To do so they will need policy support that is broader than what land trusts can achieve individually, and even collectively. Progressive policies that hold promise include Nebraska's Initiative 300, which altered Nebraska's constitution to ensure that no corporation can hold a title on real estate used for farming or ranching, and the recently passed California legislation (AN 551) that lowers property taxes on urban properties if the owners dedicate them to growing food for at least five years (Romney, 2013).

But we also know that land access is a piece in a much larger puzzle. Success will rest in part around the economic success of beginner farmers in agricultural and local food system endeavors, and such success is not a given (Galt, 2013). Though it is impossible to say what will happen on the national scale from our small sample of farmers, for the sake of closure we note what has happened to the beginner farmers interviewed in 2010. Two of the farmers are still farming with the same land

trusts on the same pieces of land, and one of those farmers now rents substantially more land trust land for his or her operation. Two other farmers have expanded production and are still farming in the same locales, but neither now farms on land trust land, due to a number of reasons that include cost, insecure and short-term tenure, and the advantage of other (private) landlords' knowledge and experience in working with agricultural lessees. Three of the farmers have stopped farming in the Central Coast of California by moving out of state where land prices are cheaper and there is less competition in the local food markets (of these, one has become an agricultural professional, working a desk job and supporting her husband's small ranching operation with an off-farm income). Remarkably, given the changing nature of many small and beginning businesses, all of these beginner farmers are still involved in farming in a substantial way. We recommend and look forward to further research into the long-term sustainability of this population of farmers who are staying in agriculture and making their social and environmental visions a reality.

We believe that while supporting beginner farmers is not the silver bullet to reverse the depopulation of the rural landscape that has occurred over the last many decades, it does speak to the hope for an agrarian revival, one that appears to be growing from the grassroots and has the potential to be supported structurally by innovative policies. From our sample (and from long-term evaluations such as that of Perez et al., 2010) it is clear that even when beginner farmers do not decide to be farmers as their main livelihood strategy, most stay in the agricultural field and are involved in some sort of agricultural production. Thus, support of beginner farmers in a multitude of forms matters, because the more folks at the table discussing the future of the American agricultural landscape, the better.

Acknowledgments

We would like to acknowledge the farmers, advocates, and land trusts that participated in this study. As always, we appreciate our respective spouses, Damian Parr and Eve Hightower, for their continual support of our work. We'd also like to thank Reggie Knox, Mark Lipson, Darryl Wong, Deborah Giraud, Brett Malone, Kendra Johnson, Tracy Lerman, Ildi Carlisle-Cummins, Jan Perez, Michael Weaver, Daniel Press, Al Sokolow, Heidi Ballard, Luis Guarnizo, and Jered Lawson for their input on research topics and subsequent drafts of the paper as well as the outstanding Galt Lab for their excellent feedback and stellar cheerleading.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Evaluating the economic and nutritional benefits and program challenges of EBT programs at farmers' markets

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Submitted August 22, 2013 / Revised October 29, December 12, and December 16, 2013 / Accepted December 23, 2013 / Published online March 10, 2014

Citation: Krokowski, K. (2014). Evaluating the economic and nutritional benefits and program challenges of EBT programs at farmers' markets. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 37–44. http://dx.doi.org/10.5304/jafscd.2014.042.011

Abstract

The number of farmers' markets that offer electronic benefit transfer (EBT) as a method of accepting federally issue Supplemental Nutritional Assistance Program (SNAP) benefits is on the rise, but the long-term success and sustainability of these programs are in question. To evaluate the success and sustainability of farmers' market EBT programs in Wisconsin, 10 farmers' markets participated in a two-year study to determine who benefits from these programs and how best to fund them. This study found that 99 percent of SNAP beneficiaries increased their fruit and vegetable intake by shopping at the farmers' market; however, farmers' market vendors realized little in increased sales. Of the 10 markets involved in the study, nine planned to seek outside funding to continue the program.

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Keywords

electronic benefit transfer, EBT, farmers' market, farmers' market managers, farmers' market vendors, food stamps, sales, Supplemental Nutrition Assistance Program, SNAP

Introduction

Farmers' markets are an ideal way to mobilize fresh local food. Farmers and other vendors load their products on trucks and bring them to a central location where customers are able to easily access products and vendors are able to easily access customers. Incorporating an Electronic Benefits Transfer (EBT) program into the farmers' market has been identified by many as the next step in serving the community and the market vendors (Jones & Bhatia, 2011; Larsen & Gilliland, 2009; Lyson & Green, 1999).

EBT allows people participating in the Supplemental Nutrition Assistance Program (SNAP), formerly called food stamps, to redeem federal benefits for eligible food items at farmers' markets.

This access has been tied to increases in fruit and vegetable consumption (Jones & Bhatia, 2011; Ruelas, Iverson, Kiekel, & Peters, 2012), an increased customer base for vendors (Fee & Meléndez, 2012; Montri, Behe, & Chung, 2013) and retention of federal tax dollars in the local community (Bertmann, Ohri-Vachaspati, Buman, & Wharton, 2012; Lyson & Green, 1999; Sadler, Clark, & Gilliland, 2013). The amount of SNAP benefits issued in Wisconsin has more than tripled since 2007 (Wisconsin Department of Health Services, 2008, 2013), while farmers' market redemption, although growing, has remained low. In 2012, only US$170,986 (0.015 percent) of the US$1,168,136,545 in benefits issued in Wisconsin were redeemed at farmers' markets (Roper & Miller, 2013).

Low benefit redemption is just one of the challenges faced by farmers' market EBT programs; the costs of implementing and managing the program must also be considered. Farmers' market EBT programs are expensive (Buttenheim, Havassy, Fang, Glyn, & Karpyn, 2012; Markowitz, 2010; Wright, Arminio, Reimer, Somers, Darlington, & Kline, 1998). The typical farmers' market costs include a wireless point-of-service (POS) device, monthly and per-transaction fees, wooden tokens, eight to 10 hours a week of staff time, marketing, and both market and vendor signs. How can farmers' markets, which typically run on shoestring budgets, add EBT processing to the market, and who should be responsible for paying for it? To answer these questions, this study sought to measure the value of farmers' market EBT programs to the market, the farmers ' market vendors, and to SNAP participants with a two-year study of 10 Wisconsin farmers' markets.

Methods

Potential farmers' market participants were initially identified through GIS maps generated from U.S. Census Bureau data. Maps were generated for Wisconsin counties with the highest SNAP issuance and participation rates based on the Wisconsin Department of Health Services' 2009 data. Once the counties were identified, 1999 census data were used to generate GIS maps. These maps identified the number of individuals below 130 percent of the poverty level by census track. Farmers' markets in each county were identified through two primary sources: the Wisconsin Farmers Market Association list, and the list generated by the Wisconsin Department of Agriculture, Trade and Consumer Protection in collaboration with the University of Wisconsin Cooperative Extension. Markets within or adjacent to the census tracts showing the greatest density of individuals in this category were contacted for participation.

Of the eighteen markets targeted by these initial inquiries, five markets agreed to participate. One of these markets was located in the city of Milwaukee and the other four in large urban areas with populations ranging from 67,000 to 105,000. Once the targeted markets were in place, an open call went out to farmers' markets around the state to assemble a list of markets interested in participating in the study. Five additional markets were chosen based on a combination of poverty data, the markets infrastructure and the manager or organization's ability to commit to participating in the study for two years. Two of these markets were located in rural areas with a high concentration of SNAP participants but a population of less than twelve thousand residents. All of the participating markets were of similar vendor mix and included a produce, meat, dairy and produce vendors and other additional SNAP qualifying items.

Three of the farmers' markets that agreed to participate in year one did not continue on in the second year due to a failure to implement the study parameters. These markets had a variety of challenges with the program including failing to implement the program, missing reporting deadlines or failing to collect the required data. Replacement farmers' markets were identified from the previously assembled list. These included new markets identified after the beginning of the project, using the same criteria used after for the open call.

Farmers' markets participating in this study were required to be new to farmers' market EBT and were prohibited from accepting credit or debit transactions during the study. No incentive programs were permitted during the project to maintain the consistency of the data across all 10 markets. Each market participating in the study

received training, information and assistance about starting an EBT program, a wireless POS device for EBT processing, wooden tokens, promotional materials, a $750 stipend for staff or program related expenses and ongoing support.

Farmers' markets conducted on site administration of the program which included recruiting and training vendors with SNAP eligible products. Markets were required to offer EBT services and track token purchases and redemption for 17 weeks for the months of July through October of each year. Staff collected surveys and demographic data on participating vendors, tracked token use and redemption and surveyed benefit users. Sales data were analyzed by market event and by individual vendor SNAP sales per market.

SNAP beneficiary surveys were also conducted by the markets during this period. These surveys did not collect any identifying information from participants so that IRB approval was not necessary. Participants were asked if they had shopped at the farmers' market before it offered EBT as a method of payment and if having EBT as a method of payment allowed them to eat more fruits and vegetables.

Each farmers' market administered its EBT program in a similar way. Markets assigned a location for the wireless POS device, either as a standalone booth or as part of the markets information table. SNAP participants brought their benefits card to that location to exchange their benefits for wooded tokens. The wooden tokens were then spent with participating vendors with SNAP eligible products. The vendors redeemed the tokens with the market. The frequency of token redemption for vendors varied by market. The larger markets with higher token volumes redeemed tokens each market day. One market, with a low token volume redeemed tokens only twice a season. Vendors were paid for tokens either with cash or by check on site or the next market day depending on the markets policy.

At the conclusion of the study, follow-up evaluations were conducted with the participating farmers' market vendors and market staff involved in the program to determine their perceptions of the farmers' market EBT program and its value. The University of Wisconsin River Falls Survey Research Center obtained IRB human subjects approval and collected the follow-up survey data to prevent bias and allow participants to answer the survey questions honestly. Farmers' market managers were interviewed by phone. Farmers' market vendor surveys were administered by email for those vendors who provided an email address. The remaining vendors were surveyed by mail. Farmers participating in multiple farmers' markets in the study were asked to fill out a separate survey for each market. Responses were then aggregated by market for analysis.

Results

Seven of the 10 farmers' markets originally identified were successful at starting up an EBT program and maintaining it for two complete seasons. The total EBT redemption at the seven markets for 2011 was US$15,571 with the redemption at individual markets ranging from US$537 to US$4,381. All of the markets saw an increase in sales in year 2 of the program. Total sales using EBT in 2012 for all seven markets was US$34,863, an increase of 224 percent over the previous year. Individual markets ranged from US$634 to US$7,384, with individual market increases of 15–277 percent (figure 1).

Annual SNAP sales of participating vendors with eligible products varied greatly for each of the six markets that provided vendor-level data. In 2011 redemptions per vendor ranged from US$0 to US$624. In 2012 redemptions per vendor increased to a range of US$0 to US$999. Participating vendors selling fruits and vegetables were the primary recipients of SNAP benefits, followed by meat, bakery, and dairy vendors. However, because individual program vendors sold multiple types of products there are no totals for individual item categories. Five of the six markets had an increase in the maximum redeemed amount for an individual vendor in 2012, although many of the vendors redeemed no EBT benefits (figure 2). Individual vendor totals are based on individual markets. The average weekly sales increased at all seven markets from 2011 to 2012. In the first year the average weekly sales for individual markets ranged from US$31.59 to US$257.71. In the second year, EBT sales increased from a range of US$37.29 to

US$434.35 (figure 3). Average individual vendor sales by week ranged from US$0.91 to US$8.89 in 2011 and US$1.86 to US$13.99 in 2012.

The number of participating vendors increased for all markets during the study. The comparison was made between the numbers of participating vendors at each market in the beginning of the program and at the end of the second year. The combined vendor participation for all markets increased 19 percent during the course of the study. Individual market vendor participation increased in a range between 0 and 43 percent.

In 2011, 607 SNAP participants were surveyed about the impact of adding EBT services to the farmers' market at the time of benefit redemption. Of those surveyed, 87 percent indicated that their fruit and vegetable consumption increased with the addition of EBT as a payment option. In 2012, 99 percent of the 1,320 individuals surveyed likewise agreed that their fruit and vegetable consumption increased. Market staff also asked SNAP participants if they had shopped at the farmers' market before it offered EBT services. In both 2011 and 2012, 75 percent of the SNAP participants indicated they had shopped at the market before it offered EBT.

Farmers' market vendors were surveyed about their experience with EBT at each individual market at which they participated in the EBT program. The survey took place in March 2013 following the conclusion of the study in 2012. Overall, 264 vendors received the survey either by mail or online. Surveys were completed by 85 vendors with a total of 104 responses. Seventeen vendors had multiple responses for participating in more than one market. Vendors participating in the EBT program were asked if they felt the program was successful. Twenty-nine percent of vendors agreed or strongly agreed. Fifty-one percent either disagreed or strongly disagreed. The remaining twenty percent of vendors neither agreed nor disagreed.

When asked what part of the program was most successful, vendors overwhelmingly indicated the ease of the token system and the ability to provide fresh local food to SNAP participants. The perceived challenges of the program included a lack of promotion and an inability to swipe the

Figure 1. Annual EBT Farmers' Market Vendor Sales by Market for 2011 and 2012 by Market (US$)

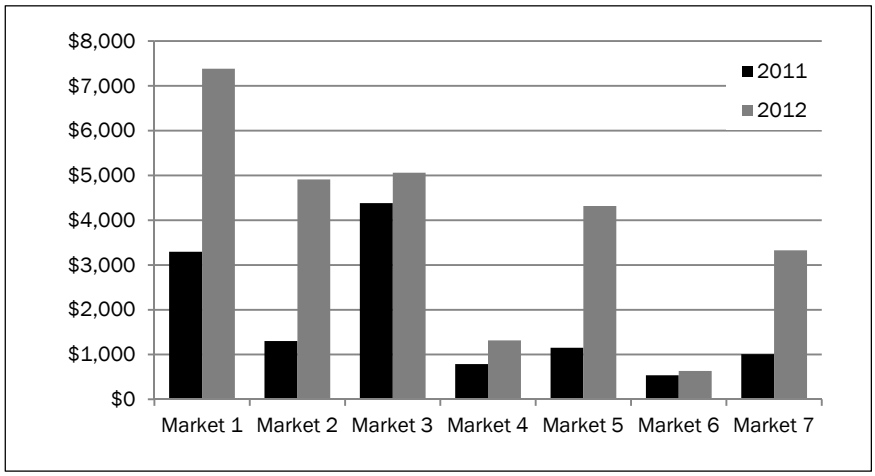


Figure 2. Maximum Annual Redemption per Vendor for 2011 and 2012 by Market (US$)

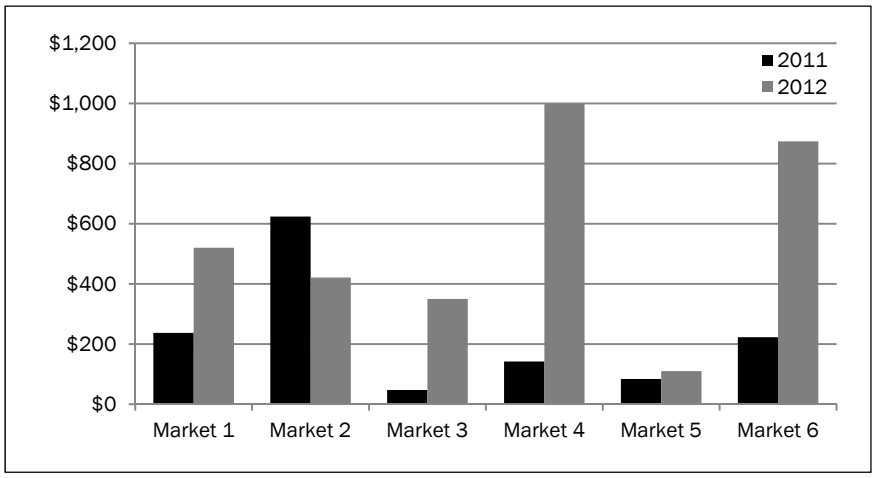
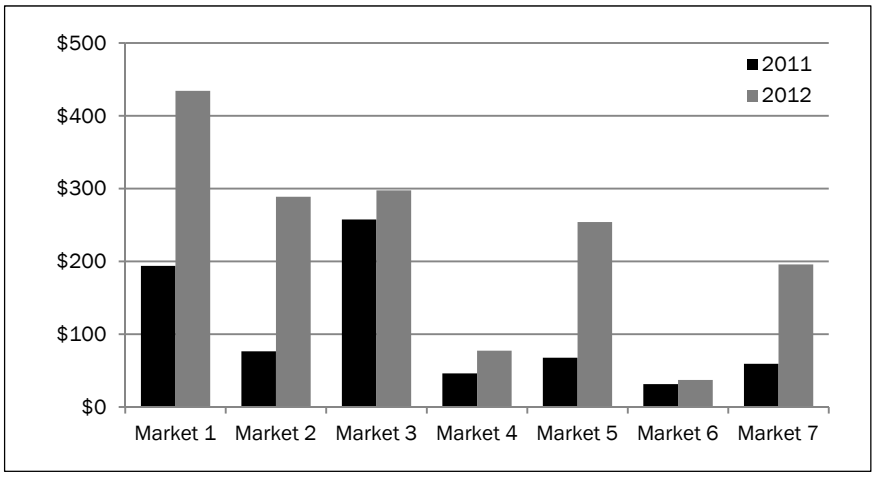


Figure 3. Average Weekly EBT Sales for 2011 and 2012 by Market (US$)



benefit card for customers at their stalls.

Although 93 percent of the surveyed vendors were supportive of continuing the EBT program at the market, only 13 percent would be willing to pay a fee to participate. Of those willing to pay a fee, 79 percent were willing to pay up to US$15, and 21 percent would pay US$16–US$25. No vendor was willing to pay a fee higher than US$25 to participate in the program. Reasons for being unwilling to pay a fee included the low profitability of the program, the extra effort for the vendor to accept EBT tokens and exchange them with the market, and the belief that vendors already pay enough in vendor fees.

Farmers' market managers who participated in the study during the 2012 market season were contacted in January of 2013 for a telephone survey regarding the program. Eight of the ten market managers participated in the survey.

All of the managers participating in the survey either agreed or strongly agreed that the EBT program was a success at their market. Nearly all indicated that the most successful aspect was the benefit to the SNAP clients. Their reasons included the appreciation of SNAP participants for the service and the repeat visits to the market by this group. Manager challenges focused primarily on the administration of the program. Dispersing tokens and reimbursing farmers required significant time and effort on the part of the market staff. Challenges also included language barriers and difficulties attracting SNAP benefit recipients.

Discussion

The farmers' market vendors and managers in this study support incorporating EBT processing into the market. Even those vendors who expressed that they were not supportive of government-issued food benefits in the comments section of our survey found them more acceptable if they were being spent at the farmers' market with local farmers. These responses are similar to those found in other studies measuring the impact of incorporating EBT into farmers' markets (Buttenheim et al., 2012; Cole, McNees, Kinney, Fisher, & Krieger, 2013). These studies also reinforce the concept that while market managers and the majority of vendors are philosophically supportive of the program, their support diminishes when the program costs are no longer subsidized.

In addition to the cost of the wireless devices and program fees, many markets, even those run by established organizations and municipalities, simply lack the capacity and infrastructure to administer the program. The additional accounting duties and legal responsibilities of the program are perceived as a barrier to many markets (Cole et al., 2013). Managers' responses in the survey affirmed the labor-intensive nature of the program. Many of their challenges related to the staff time needed to staff a booth at the market and to redeem the tokens with vendors. The eight to 10 hours a week of additional staff time for EBT administration did not allow time for many of the best practices recommended for farmers' markets EBT programs, including onsite community events and reaching out to organizations serving SNAP participants (Owens & Verel, 2010). Increasing the engagement of SNAP participants through incentive programs and education may increase sales and create greater justification for farmers' markets to run EBT programs (Baronberg, Dunn, Nonas, Dannefer, & Sacks, 2013; Fee & Meléndez, 2012).

In addition to the administrative challenges of

operating an EBT program, markets must also measure the program's success. Market managers, vendors, and SNAP participants define success very differently. In the follow-up surveys, all of the farmers' market managers agreed or strongly agreed that the EBT program was a success at the market, while only 29 percent of vendors thought it was successful. The managers based their definition of success on the comments of the SNAP participants, while the vendors based it on the financial return. Managers must also think of how potential funders for the program will define success. EBT programs must be valued by all of the stakeholders to attain positive effects over the long term.

Vendor surveys combined with sales data indicate that success for vendors is related to an increase in sales. Although SNAP redemption increased 224 percent in year two over year one, the most any single vendor benefited was US$999 in gross revenue. The farmer must still deduct the costs of production, marketing, and labor, leaving significantly less net additional income for the farmer.

It also takes vendors more effort to conduct an EBT transaction than a cash transaction (Cole et al., 2013). Vendors must keep track of tokens, count them, and redeem them with the market office. Some vendors must wait weeks to redeem their tokens and receive a check for their value. This system is a great deal more complicated than the simple process of exchanging their products directly with a customer for cash.

Who should cover the cost of the program? The managers of farmers' markets that indicated they would continue the program after the study ended said they would seek outside forms of support for the program, including sponsorships, partnerships, grants, and contributions. This adds yet another layer to the complexity of hosting an EBT program to already overextended market managers. Once a program supporter has been identified, managers may be expected to continually collect data and report back to the funding organization. Many farmers' markets in Wisconsin do not have not-for-profit status and cannot accept tax-deductible contributions.

Nevertheless, for farmers' markets unable or unwilling to take on these responsibilities, other opportunities still exist. In our study, two of the farmers' markets participating had their EBT programs run separately from the market by an outside group. In addition to finding outside sources of revenue to support the program or externalizing the program, markets can also look for ways to reduce costs. The cost of a wireless POS unit is a significant barrier for many markets wishing to start an EBT program (Buttenheim et al., 2012; Cole et al., 2013). These units are not required for all markets. Although they are low-tech, paper vouchers can still be used for SNAP sales at a farmers' market. Authorized markets simply call in with the appropriate information, including the transaction amount. Once the transaction is complete the SNAP participant signs the voucher and both parties get a copy. This method is practical and economical for markets with low redemption volume that wish to improve food access.

Evolving software technology piloted by developer Novo Dia Group may also improve the access of vendors. This software currently enables participating vendors at Michigan farmers' markets to accept several types of benefits cards, including SNAP, Women, Infants and Children Electronic Benefits Transfer Cash Value Benefits (WIC EBT CVB), Farmers Market Nutrition Program (FMNP), and Summer EBT for Children (SEBTC). Additionally, vendors can process debit and credit card transactions with the same device, providing even more sales opportunities with no extra hardware investment (Wiles, 2012). Smartphone apps that process EBT transactions are rapidly developing and may soon make accepting EBT on the vendor level more affordable. Enabling widespread use of EBT technology by market vendors would remove the additional costs incurred by a market-run program, including staff time and tokens. Vendor-level transactions have also been linked to increased overall SNAP redemption at farmers' markets when compared to market-run programs (Buttenheim et al., 2012).

Even more important and more impactful than finding sponsors and reducing costs is increasing the volume of SNAP traffic at farmers' markets. Wisconsin farmers' markets redeemed just .015 percent of the EBT benefits issued in the state in

2012. Michigan, the leader in redemption in the Midwest, redeemed 0.05 percent of benefits issues in that state (Roper & Miller, 2013). What kind of impact on nutrition and local economies could be realized if just one percent of the US$74 billion in SNAP benefits issued in 2012 were spent on local agricultural products at farmers' markets? How many more farmers' markets could thrive in neighborhoods with high densities of SNAP participants?

Conclusions

Increasing access to fresh fruits, vegetables, and other locally produced SNAP-eligible items is not a simple process. SNAP participants are able to eat more fruits and vegetables when local farmers markets' accept EBT, but this increased access has not translated into meaningful economic impact for farmers' markets vendors in Wisconsin.

The answer to increasing the efficiency of this program may be to transition it to the vendors. If vendors were to adopt smart-device technology and offer EBT services at the point of sale, it would eliminate many of the program's costs and complexities. For vendors to justify the expense of adopting this technology and paying for its use, however, accepting SNAP benefits must be profitable. More research is needed on ways to substantially increase SNAP sales at farmers' markets or reduce the cost to vendors in order to create a sustainable system that benefits farmers' markets, vendors, and SNAP participants.

Acknowledgments

This study was funded by the United States Department of Agricultures' Farmers' Market Promotion Program.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Evaluating the South Memphis Farmers Market as a strategy to improve access to healthy foods: Lessons from 2011

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Submitted June 13, 2013 / Revised November 27, 2013, and January 18, 2014 / Accepted January 19, 2014 / Published online March 19, 2014

Citation: Hicks, K., & Lambert-Pennington, K. (2014). Evaluating the South Memphis Farmers Market as a strategy to improve access to healthy foods: Lessons from 2011. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 45–59. http://dx.doi.org/10.5304/jafscd.2014.042.014

Abstract

Limited access to fruits and vegetables is an issue for many low-income and minority neighborhoods and likely plays an important role in the development of health disparities. Local farmers' markets are a growing response to low-quality food environments, but can improve food security only if they are sustainable over the long term and broadly accessible to residents. The South Memphis Farmers Market emerged as one of the first actions from a participatory neighborhood planning and revitalization effort involving local nonprofits, neighborhood residents, and faculty and students from the University of Memphis in 2010, and maintains a local advisory committee to help tailor operational decisions to the neighborhood context. This paper is based on 2011 data from an ongoing mixed-methods evaluation of the market, designed to assess whether it is meeting the goals outlined in the neighborhood plan in terms of serving as an accessible source of fresh fruits and vegetables, and whether any changes to market policies are necessary to ensure its sustainability. This paper examines ethnographic data collected during participant observation in advisory committee meetings and during market hours, and quantitative data from an end-of-season survey of market shoppers. The analysis suggests that the market is expanding neighborhood access to produce, and that the guidance provided by the advisory committee has been essential to this success. It also highlights possible barriers to access and potential policy interventions to address them.

Keywords

evaluation, farmers' markets, federal nutrition benefits, healthy foods, low income, mixed methods, SNAP

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Introduction

Residential areas offering limited access to fresh, healthy foods have emerged as a critical public health issue in recent years (Dinour, Bergen, &

Yeh, 2007; Eisenhauer, 2001; Lee, Gundersen, Cook, Laraia, & Johnson, 2012; Walker, Keane, & Burke, 2010). Food access is a multidimensional phenomenon, reflecting a mix of geographic, economic, social, and cultural factors. In a meta-analysis of published studies, Beaulac, Kristjansson, and Cummins (2009) found an interaction between neighborhood access to fresh food like fruits and vegetables and low socioeconomic status (SES) of households. They argue that "structural inequalities in the food retail environment" in low-income, minority neighborhoods amplify socio-economic barriers to accessing affordable, healthy food and "may contribute to inequalities in diet and diet-related outcomes" (Beaulac et al., 2009, pp. 4–5). Recent research has shown that food in some urban neighborhoods is more costly and limited in quality and type (Hendrickson, Smith, & Eikenberry, 2006). Additional explanations for this relationship between economic circumstances, socioeconomic status, and health include an inverse association between the energy density of available foods and their costs, and constraints on access to transportation (Dinour et al., 2007; Drewnowski & Darmon, 2005; Larsen & Gilliland, 2008; Schroder, Marrugat, & Covas, 2006).

Recent reviews provide evidence for a link between food environment and health (Larson, Story, & Nelson, 2009; Michimi & Wimberly, 2010; Walker et al., 2010). In general, diets high in fresh fruits and vegetables are associated with lower rates of obesity and central adiposity, as well as related conditions such as diabetes (Baxter, Coyne, & McClintock, 2006; Hu, 2003; Roblin, 2007). A number of studies have found that neighborhood access to supermarkets and full-service restaurants predicts fruit and vegetable consumption, controlling for income (Izumi, Zenk, Schulz, Mentz, & Wilson, 2011; Kamphuis, Giskes, de Bruijn, Wendel-Vos, Brug, & van Lenthe, 2006). Similarly, neighborhood food access is related to the risk of obesity (Gibson, 2011; Rundle et al., 2009; Zick, Smith, Fan, Brown, Yamada, & Kowaleski-Jones, 2009). Crucially, persistent residential segregation and uneven economic development in neighborhoods occupied primarily by people of color contributes to systematic inequalities in healthy food access and to the development of health disparities (Drewnowski & Darmon, 2005; Larson et al., 2009; Walker et al., 2010).

In response to the ongoing difficulty associated with attracting large grocery stores and supermarkets to inner-city neighborhoods (Eisenhauer, 2001), a number of communities have instituted local farmers' markets to enhance seasonal access to affordable fresh fruits and vegetables (Boyle, Stone-Franciso, & Samuels, 2006; George, Kraschnewski, & Rovniak, 2011; Larsen & Gilliland, 2009; Markowitz, 2010; Ruelas, Iverson, Kiekel, & Peters, 2012; Young, Karpyn, Uy, Wich, & Glyn, 2011). Not only are farmers' markets an urban food intervention, but they also play an important role in rebuilding local food systems (Gillespie, Hilchey, Hinrichs, & Feenstra, 2007; Lyson, Gillespie Jr., & Hilchey, 1995), urban revitalization (Bubinas, 2011; Faulk, 2006; Reardon, 1998), and community building (Payet, Gilles, & Howat, 2005; Szmigin, Maddock, & Carrigan, 2003). Despite the generally positive impact of farmers' markets, some research has shown that markets in low-income neighborhoods face economic challenges — including difficulty attracting shoppers and farmers — that constrain food access or food justice aims (Alkon, 2008; Guthman, Morris, & Allen, 2006; Markowitz, 2010; Winne, 2008). A number of studies suggest that farmers' market coupon programs help attract shoppers and increase their consumption of fruits and vegetables during the summer months (Anliker, Winne, & Drake, 1992; Balsam, Webber, & Oehlke, 1994; Herman, Harrison, Afifi, & Jenks, 2008; Johnson, Beaudoin, Smith, Beresford, & LoGerfo, 2004; Racine, Smith Vaughn, & Laditka, 2010), and that markets may exert downward pressure on neighborhood food prices by increasing competition (Larsen & Gilliland, 2009). Both farmers and customers benefit from direct sales and federal subsidies: for example, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and Senior Farmers' Market Nutrition Programs (SFMNP), the Supplemental Nutrition Assistance Program (SNAP), and a number of competitive USDA grants for market development (Becker, 2006). Additionally, Markowitz (2010) suggests that the success of markets in low-income neighborhoods depends heavily on community engagement and collabora-

tion with local institutions.

Growing scholarly focus on farmers' markets reflects their increasing frequency in the US since the 1970s (Brown, 2001), but evidence of their effectiveness as an intervention to address neighborhood food environments and quality of life is limited (McCormack, Laska, Larson, & Story, 2010). In addition to longitudinal studies assessing the relationship between access to farmers' markets and health outcomes such as body composition (e.g., obesity risk), scholars have argued for the need to explore the social benefits of markets (Andreatta & Wickliffe, 2002; McCormack et al., 2010). Important for understanding the health impact of local markets is assessing whether they are accessible and attractive to a broad range of residents, and whether their practices are sustainable over the long term. Opening a market may not be sufficient to increase neighborhood access to healthy foods if the same influences that constrain food purchasing choices prevent individuals from attending, and if the market cannot meet operational demands.

Aware of the relationship between accessing quality, affordable food, revitalizing the neighborhood, and alleviating health disparities, The Works, Inc., a community development corporation, in conjunction with a resident advisory committee, established the South Memphis Farmers Market (SMFM) in mid-summer 2010. Starting in 2011, faculty and students from the University of Memphis worked with the advisory committee, which is made up of two to five resident-volunteers, representatives from two nonprofits that support the market, and staff from The Works, Inc., to conduct a systematic evaluation of the SMFM to assess the nutritional, economic, and social impacts of the market, and to identify specific strategies for enhancing its effectiveness as an intervention to improve access to healthy foods. This paper, based on analysis of ethnographic and survey data, explores customer characteristics and perceptions of the market, with an emphasis on determining whether the market is meeting the healthy food access goals outlined by residents in the SoMe Revitalization Action Plan (SoMeRAP), a participatory neighborhood planning initiative. We use multiple logistic regression analysis to examine what characteristics are significant predictors of shopping frequency and spending at the market, and to determine whether there is any evidence of systemic barriers to access which might be addressed. We complete this exploratory analysis with a discussion of changes or improvements that might be necessary to ensure the market's sustainability, and lessons learned from the evaluation.

Program Description

South Memphis is a predominately African-American residential neighborhood in the urban core of Memphis. According to the 2010 Census, 29.8 percent of South Memphis adults over the age of 25 years did not graduate from high school, 28.4 percent of eligible workers were unemployed, and median household incomes trailed both those of the state by over 49 percent and the nation by 41 percent. In addition, nearly 37 percent of families lived in poverty and approximately 51 percent of these households had children under the age of 18. At the same time, a stable base of long-time homeowners and well-respected civic, social, and faith-based institutions are among the area's most important assets and change agents (Lambert-Pennington & Reardon, 2009).

The Works, Inc., was established in 1998 by the local St. Andrew African Methodist Episcopal (AME) Church to address housing and social development needs within the community. These organizations approached faculty at the University of Memphis in 2008 to help facilitate these goals through a neighborhood planning process, leading to the SoMeRAP partnership. The focus of SoMeRAP is an area consisting of 140 blocks within the greater South Memphis community which makes up The Works, Inc., service area. Participatory planning, also known as an empowerment (Reardon, 2005) or equity model of planning (Reardon, Ionescu-Heroiu, & Rumbach, 2008), is a community-based strategy taking its cues from participatory action research (PAR), Saul Alinsky–style direct-action organizing, and Freire-inspired popular education (Freire, 2000). In contrast to a professional and expert-driven model of neighborhood planning, participatory planning prioritizes the expertise, insights, and priorities of local residents and stakeholders in the research, analysis,

planning, and action phases of the process. Residents of the neighborhood and faculty and students from the University of Memphis worked together to collect and analyze data about the neighborhood, including land use and building condition surveys; interviews with more than 50 residents, organizational leaders, and other stakeholders; 174 door-to-door surveys; and facilitation of four community forums (Lambert-Pennington, Reardon, & Robinson, 2011). Through this process, residents identified nine overall development objectives and over 40 specific projects, and committed to working together on their top priorities, one of which was improving the neighborhood food environment. SMFM is one of the first projects resulting from SoMeRAP.

Over 6800 people live within The Works, Inc.'s service area, which has been identified as a food desert due to the absence of a full-service grocery store within one mile (1.6 km) and low median income of local households (U.S. Department of Agriculture, 2013). Research conducted for the SoMeRAP suggests that food-related retail operations in or near the neighborhood are largely limited to convenience and corner stores, small grocery stores, and some fast-food restaurants (Lambert-Pennington & Reardon, 2009). In the door-to-door survey, residents reported travelling two to five miles (3.2 to 8.0 km), often by bus or car, to purchase their weekly groceries. During the SoMeRAP action group discussions, women with children often discussed their difficulties with taking the bus, especially transporting their food home from the store. The closest store is 1.5–2.5 miles (2.4–4.0 km) from the neighborhood (depending on what area of the neighborhood a resident lives in). Residents cited this outlet as a store of last resort, reporting poor quality and selection, as well as lack of cleanliness. The two grocery stores most often frequented by residents are three miles (4.8 km) away from the neighborhood; travel on public transit requires changing buses en route and takes about 45 minutes each way. Thus, some residents opted to hire a taxi for the return trip, which reduced the funds available to spend on food.

Residents pushed to make a farmers' market a top neighborhood redevelopment priority to begin to address this deficit and its negative health impacts. St. Andrew AME quickly responded to the residents' call by donating an unused commercial space to The Works, Inc., for the market. A group of SoMeRAP participants volunteered to serve as the advisory committee. Within two months, the façade of "Old Carter's Fish Market," widely recognized as a former neighborhood institution, was colorfully transformed by a mural featuring fresh vegetables, painted by local youth in the lead-up to the market's opening in July 2010. The goals of the SMFM are to provide "access to healthy and affordable foods in the South Memphis community" and to "strive to create an atmosphere that contributes to the success of local growers and producers" (South Memphis Farmers Market, 2013). The Works, Inc., in association with the advisory committee, runs the SMFM. Staffed primarily by volunteers, the market is open on Thursdays from 12:00 PM to 6:00 PM between May and October. Extending the participatory practices and expectations of the SoMeRAP process, residents on the advisory committee played a key role in setting market rules and vendor guidelines. Drawing on their understandings of and experiences in the local food environment, they prioritized keeping the market small and accessible to local residents and maintaining a focus on fresh fruits and vegetables by (1) limiting the number of vendors to 10 overall and allowing no more than two non-food vendors; (2) keeping vendor fees low to encourage participation in the market; (3) allowing limited resale to increase produce variety; (4) placing no restrictions on growing practices; (5) relying on volunteer labor; and (6) prioritizing SNAP and SFMNP voucher acceptance.

The SMFM began accepting SNAP Electronic Benefits Transfer (EBT) cards during the 2011 season. Although there are more markets that currently accept SNAP in Memphis, SMFM was one of only two in 2011. Additionally, the market began participating in the Wholesome Wave Foundation's Double Value Coupon Program, referred to by market staff as "Double Green$," which matches up to US$10 of SNAP purchases each week. The market also recruited several farmers approved by the Shelby County Health Department to redeem SFMNP vouchers. Seniors

generally receive US$40 in vouchers that they can spend only during the months of July and August. The SFMNP system had proved controversial in 2011, as seniors faced long waits in intense heat for the small number of approved vendors at the downtown Memphis Farmers Market (Alexander, 2011). Learning from the experience of this larger market, volunteers at the SMFM set up a seating area under the small permanent canopy, asked shoppers to sign in, and called them up in groups of 25 to shop. In the subsequent year, more farmers were approved to take the vouchers, and seniors had several additional markets they could choose to attend.

Methods

The SMFM research team consisted of two faculty members (the authors), three anthropology students (two graduate students and one undergraduate), and the market's advisory committee. In keeping with the participatory orientation of SoMeRAP, we worked with members of the advisory committee to design and test each component of our research strategy. Representatives from The Works, Inc., provided weekly shopper and vendor counts, and values of SNAP, Double Green$, and debit and credit card transactions. The University of Memphis Institutional Review Board approved the study procedures.

Participant Observation

The research team conducted observations in the course of participating in the weekly advisory committee meetings and volunteering at the market. During the committee meetings we engaged in discussions of any issues that emerged in prior weeks of market planning, and sought interpretation of observations from residents. At each market we helped with setup and operation, engaged in informal conversations with farmers, shoppers, and volunteers about issues such as produce availability, preparation strategies, and the neighborhood food environment, and made descriptive observations. During most market days we also conducted structured data collection, which focused on identifying where shoppers lived and the variety and availability of produce. For example, we periodically set up a poster-sized map of the city and asked shoppers to place a sticker-dot on their nearest cross-streets: we collected three maps throughout the course of the season. We also recorded the products available from each vendor, and interval inventories of purchases. We compiled electronic copies of field-notes and data records in a central database for later analysis.

End-of-Season Surveys

In the last two weeks of the market season, during October 2011, we conducted an anonymous survey of shoppers over the age of 18. Following the participatory nature of the project, the surveys were constructed in collaboration with staff from The Works, Inc. based on shared research objectives. We tested the survey with members of the advisory board, including several community residents, over two meetings. Members took the survey, suggested a number of changes in wording and other changes, and then reviewed these changes the following week. The goal was to collect 150 surveys over this two-week period. In order to determine the appropriate sample size, we based our power calculations on an estimate of the total number of shoppers over the season based on weekly shopper counts taken by members of The Works, Inc. The final survey included 39 questions and focused on the following dimensions:

- Shopping frequency
- Levels of satisfaction with various aspects of the market
- Shopping and eating behaviors
- Health concerns or conditions
- Suggestions for expanding items and programming at the market

Additionally, we collected demographic information such as age, gender, employment, and monthly income. We were most interested in the difference between shoppers in the lowest income category and everyone else. Aware of residents' comfort in reporting monthly rather than annual income, we converted the annual income categories standard in the U.S. Census and used in SoMeRAP to monthly categories.

With the help of vendors, staff, and advisory board members, over the full course of each of the

two market days we solicited anonymous surveys from each shopper. This sampling strategy is similar to that used in other studies of farmers' markets (Ruelas et al., 2012). We offered assistance in filling out the survey where necessary. Participants received an incentive of a US$10 grocery card or the equivalent in market tokens. A graduate research assistant entered responses into Qualtrics 2012 software (Qualtrics Labs, Inc., Provo, Utah).

Data Analysis

We carried out qualitative analysis of ethnographic field notes, coding for both pre-determined and emergent themes. Some of the domains we explored were perceptions of the market, social interactions, and discussions of produce and preparation techniques.

We carried out statistical analyses of the survey data using Stata 10.0 (Statacorp, College Station, Texas). In addition to compiling descriptive statistics, we used multiple logistic regression analysis to explore which characteristics predict 1) being a frequent market attendee (average attendance ≥ twice a month) relative to being a first-time or infrequent shopper, and 2) spending, on average, more than US$15 at the market per visit, excluding first-time shoppers. To check the validity of including first-time shoppers in the first model, the same analysis was run without this group to determine whether the results were substantially different (they were not). In the first stage of analysis, age in years, monthly take-home income (modeled as a dummy variable for income > US$800), the number of household members, and gender were entered as potential confounders. To preserve degrees of freedom, variables that were not significantly related to the outcome were excluded. In the second stage, potential predictors were added as a group and p levels and goodness of fit tests were used to determine which predictors to exclude from the final models. In both models, these included being a neighborhood resident, driving to the market, eating frequently at restaurants, having a household member with a chronic disease, employment status, and using EBT or SFMNP vouchers to purchase produce. Finally, we ran a series of diagnostic procedures to assess the validity of each final model including tests for multicollinearity, or strong relationships between predictor variables, and for undue influence by outlying observations (there was no evidence of these issues in the models below). We used a significance level of 0.05.

Results

Weekly shopper counts indicate that approximately 3, 226 people came to the market from the last week of June through the end of the market in 2011, and the number of shoppers per week ranged from 90 to 378 with a mean number of 215 (see figure 1). Observations indicated that attendance peaked during the months of July and August when seniors were able to cash their SFMNP vouchers. In fact, operators and farmers agreed to start two or three hours earlier during those months to handle the increased volume of traffic. Seventy-one percent of survey respondents were residents of one of the surrounding neighborhoods. This finding is consistent with the interactive mapping exercise, which showed that the bulk of shoppers lived within a one-mile (1.6 km) radius of the market. Informal discussions with shoppers indicated that many of those from outside the neighborhood worked in the area and had discovered the market while passing by. SMFM sits on an alternate trucking route just off an interstate highway, so there is a relatively high flow of vehicle traffic during business hours. Most respondents said that they attended either every week (39 percent) or every other week (25 percent), but 23 percent (n=26) were coming to the market for the first time the day of the survey.

Thirty-one percent of survey participants were employed for wages, 26 percent were retired, and 31 percent were unable to work or currently unemployed. Thirty-eight percent reported a monthly household take-home income of US$800 or less, which is below the 2011 poverty threshold of roughly US$1,221 a month for a two-person household (US Census Bureau). The average household size among survey respondents was 3.2 persons. Sixty percent reported spending between US$100 and US$300 each month on groceries for their household, including SNAP benefits. The largest proportion of people got to the market by driving but many walked (27 percent) or caught a

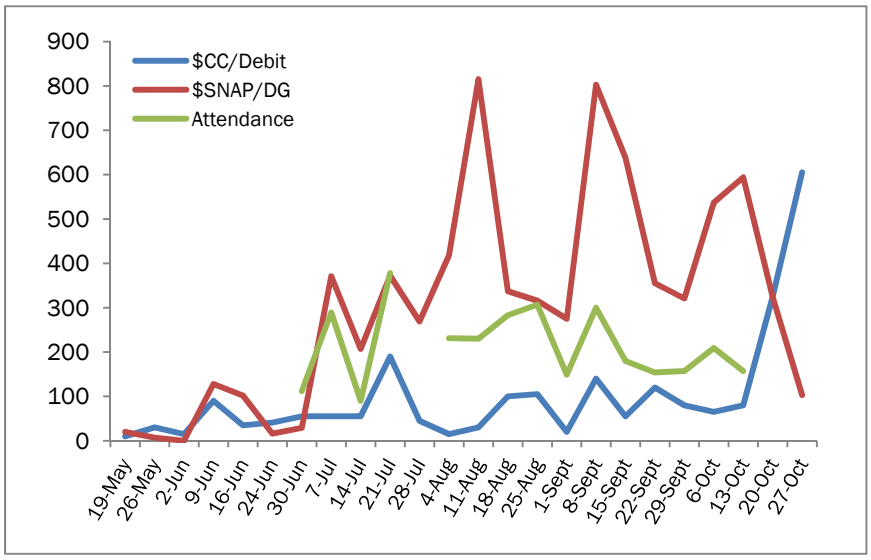
ride with a family member, neighbor or friend (24 percent). Finally, 37 percent of the individuals in the sample reported having made changes to their diet to deal with a health condition, which ranged from eating less salt and fried foods to eating more fruits and vegetables and changing portion sizes.

Of the individuals who had attended the market previously, the vast majority reported high levels of satisfaction with its operation. Virtually all respondents said they were very satisfied or satisfied by the variety, quality, affordability, location, parking opportunity and days of operation of the market, although in written responses a small number of people did suggest opening the market more than one day a week, improving spatial organization, and offering a greater variety of produce. Ninety-three percent of all shoppers thought that they saved money by shopping at this market, because they did not have to travel a long distance outside the neighborhood, because of the freshness of the produce (lasted longer/threw less away), or because they perceived the prices to be competitive with local supermarket chains. The similarity in responses across attendance categories supports the conclusion that, at least among this particular sample, lower attendance frequency is not a result of dissatisfaction with the market, and that produce is relatively affordable.

A common perception expressed by both customers and farmers is that SMFM is among the most friendly and informal of all the markets in the city. Farmers noted that they receive more volunteer assistance, and that customers are more likely at this market than others to return in subsequent weeks to express their appreciation after making a purchase. A local bus driver's reaction to the market illustrates this sense of community: Driving the route with a stop right in front of the vendors, this woman would often open the door to socialize and ask farmers what they were selling. She was a strong advocate of the market, and on several occasions she stopped to allow passengers time to shop. The downside of the informality of the market is illustrated by several comments from shoppers and passersby that the market did not look "serious," and the distress expressed by volunteers and vendors when food wrappers and other trash would start to pile up on the site.

When asked in the survey to identify what forms of payment they use, most shoppers reported relying on cash (86 percent), while up to 32 percent used SNAP and a much smaller number used SFMNP vouchers (6 percent) and credit or debit cards (9 percent). Around 60 percent of those who used SNAP and SFMNP added to their purchases with other forms of payment. On average, SNAP purchases were just over US$10, which suggests that many shoppers were spending just enough to maximize their Double-Green$ tokens. Informal conversations with customers suggest that SNAP shoppers may shop at the market every week, and reserve some of their tokens for the end of the month when they have run out of EBT and cash. The majority of shoppers (74 percent) spent between US$6 and US$20 each visit. Figure 1 illustrates the weekly values of SNAP/Double Greens and credit/debit card purchases, and shopper counts when available, from each week of operation. Sales from these sources throughout the season

Figure 1. Monthly Attendance, Credit Card and Debit (US$), and SNAP and Double Greens Sales (US$) for the 2011 Season



were US$9,718. Given the high reported use of cash and the increased volume of shoppers during the SMFMP, total market sales were likely much higher. SNAP purchases (and, likely, other forms as well) started the season relatively slow, but rose in July, and peaked in August and September, possibly associated with the adoption of the Double Green$ matching program, the higher traffic volume related to SFMNP vouchers, and increased variety due to the peak season for harvesting.

We ran a number of bivariate tests of association to determine if there were significant differences between neighborhood residents and non-residents who attend the market, to assess the possibility that non-resident shoppers have a higher SES than resident shoppers. In particular, we were interested in exploring the potential implications of attendance and payment type for the long-term sustainability of the market. This was based on qualitative evidence that individuals from outside the neighborhood were often passing by, possibly on their way to or from work, and on the work of other authors suggesting that attracting cash from outside the neighborhood might be an important component of long-term sustainability (George et al., 2011). There is no evidence that nonresidents were more likely to have higher income, or to be employed for wages; however, they were more likely to use cash or credit and debit cards exclusively for purchases (X^2=5.60, p=0.02).

Vendor participation ranged from one during the slowest weeks to nine at the height of SFMNP voucher season in July. Two vendors who attended almost every week of the market were responsible for a majority of SNAP and debit and credit card purchases, and their sales were relatively consistent throughout the season. Four vendors were approved to take SFMNP vouchers and attended the market exclusively during the months of July and August. Conversations with participating vendors suggest that SMFM does a high volume of SFMNP sales relative to other Memphis area markets, and that this market makes a significant contribution to these farmers' total sales during this period. Vendors also commented on the relatively high volume of SNAP sales at this market, and the peak of these sales during the first one to two weeks during each month, just after EBT cards have been reloaded. Thus, during the spring and fall months, when attendance is lower and quantity of produce is smaller, the market can support fewer vendors. Finally, farmers note that shoppers are most interested in buying tomatoes, green tomatoes, okra, greens, and fruit like peaches, plums, and melons, all of which are highly seasonal. Although greens are available early on and late in the season, conversations with customers and passersby indicate that the absence of fruit may be one reason for the relatively lower attendance in May and June.

Table 1 displays selected descriptive characteristics from the end-of-season survey for frequent and less-frequent market shoppers.

Table 1. Characteristics of Frequent (≥ 2x visits per month) and Less Frequent Market Attendees

Characteristic	Infrequent (N=41) %	Frequent (N=72) %	Total (N=113) %
Neighborhood resident	66	76	72
Uses EBT	41	25	32
Female	58	67	64
Monthly take-home pay ≤ US$800	44	35	38
Employed for wages	30	32	31
Retired	5	38	26
Eats out ≥ 3x per week	42	20	29
Household member is diabetic	44	33	35
Household member has high BP	44	61	55
No. of Household residents (mean, (S.D.))	3.8 (2.0)	2.8 (1.7)	3.2 (2.1)
Age (mean, (S.D.))	43.1 (13.4)	56.9 (14.6)	51.9 (14.8)

Table 2. Odds Ratios and 95% Confidence Intervals for Logistic Regression Model Predicting High Market Attendance
Log likelihood=–42.89 N=93

Characteristic	Odds Ratio (95% CI)	P Value
Age	1.08 (1.03-1.12)	0.00
Monthly take-home pay ≥ US$800	0.52 (0.15-1.79)	0.30
Neighborhood residence	5.61 (1.53-20.53)	0.01
Drives	4.56 (1.33-15.58)	0.02
Eats out ≥ 3 times a week	0.30 (0.09-0.99)	0.05
Uses SNAP or SFMNP	0.36 (0.11-1.22)	0.10

Table 3. Odds Ratios for Logistic Regression Model Predicting Average Spending of ≥ US$15
Log likelihood=-34.35 N=72

Characteristic	Odd Ratio (95% CI)	P value
Age	1.03 (1.00-1.08)	0.85
Monthly take-home pay ≥ US$800	2.97 (0.79-11.24)	0.11
Uses SNAP or SFMNP	6.37 (1.63-24.82)	0.01
Household member is diabetic	4.10 (1.25-13.47)	0.02

Frequent market attendees were older and lived in smaller households, and a higher percentage of them were female, retired, neighborhood residents, and lived in a household with someone who has high blood pressure. In contrast, a higher percentage of infrequent shoppers used SNAP, had a monthly take-home income of US$800 or less, ate out three or more times a week, and lived with someone who is diabetic. Bivariate tests of association indicate significant differences between frequent and infrequent shoppers only in the proportions of retired people (X^2=14.49, p=0.00) and people who eat out frequently (X^2=6.61, p=0.01), although there is a marginal association between shopping frequency and SNAP use (X^2=3.31, p=0.07). A relatively large proportion of all survey participants lived in households with someone who has a chronic health issue, and several respondents reported more than one of these conditions. Having a household resident with high blood pressure, but not diabetes, was significantly related to age (Kruskal-Wallis Test, X^2=5.50, p=0.01).

Multivariate Analysis

Table 2 displays the results of the logistic regression analysis predicting the likelihood of being a frequent market shopper. In the base model including age, gender, income, and household size, only age was significantly related to this outcome, but income was left in the model to control for socioeconomic status. Survey participants had significantly higher odds of shopping frequently at the market if they were a resident of the surrounding neighborhood, drove, or were older, and had significantly lower odds if they ate out frequently, controlling for monthly income. There is no evidence that having a chronic health condition or receiving federal nutrition benefits was related to the frequency of market attendance. The association between driving and market attendance may relate exclusively to ease of getting to the market, even within the neighborhood, but it may also be an indirect measure of SES and purchasing power. We further tested for an interaction between driving and residence, but this term was not a significant predictor of attendance. A chi-square test reveals that driving and take-home income are significantly and positively related to one another (X^2=19.13, p=0.00), supporting the second of these interpretations, although they are certainly not mutually exclusive. We also wondered whether frequency of outside eating might relate to take-home income, but found no association between these variables (X^2=0.42, p=0.52).

Table 3 displays the results of the logistic regression analysis predicting the likelihood of spending, on average, US$15 or more at the market. Controlling for age and income, shoppers had higher odds of spending ≥ US$15 if they received government subsidies, such as SNAP or SFMNP vouchers, and if a member of their household was diabetic. Neither age nor income was a significant predictor of spending, although they were both positively associated with this outcome. A chi-

square test indicates that the two outcome variables are also related to each other: people who attend the market more frequently are more likely to spend more than US$15 ($X^2$=7.13, p=0.01).

Discussion

The quantitative analysis provides some important insights about who is more likely to shop at the market. The association between neighborhood residence and shopping frequency is consistent with the prediction of the research team and the objectives of SoMeRAP. Memphis now boasts at least 14 markets, and SMFM is among the smaller markets in the city, so it is unlikely to serve as a destination for nonresidents who are not already driving in its vicinity. There are, however, no other markets within one mile of this neighborhood. An ongoing question for the advisory committee and market operators is how widely to advertise the market beyond the immediate neighborhood. Increased attendance may contribute to the long-term sustainability of the market, but this must be balanced with the potential influence of increased traffic on prices, and the need to avoid direct competition with other markets and potential loss of business. The finding that nonresidents are more likely to pay for their purchases with cash or credit and debit cards suggests that working to attract shoppers en route past the market, perhaps through high-impact permanent signage, is an important strategy to enhance sustainability.

The association between attendance and age may mean that older residents place a higher value on fresh produce, but it also may relate to the timing of the market. Operating hours of 12:00-6:00 PM on a weekday may reduce the attendance of individuals in the labor force. These results may even underestimate the influence of age on attendance. The busiest time for the market is in the two-month period (July-August) during which SFMNP vouchers are redeemed. This is likely influenced partly by the small number of vendors throughout the city approved to take these vouchers. The fact that only seven of the survey participants were SFMNP users may suggest that some of these shoppers attend the market only during voucher season. These results point to a need to investigate further the influence of market hours on accessibility. This will include conducting separate surveys amongst SFMNP voucher shoppers to determine if and why they may be less likely to attend during non-voucher season.

Another need that has been identified is to prioritize outreach and education among younger residents. One way SMFM is beginning to address this is cooperation with a learning farm program. During the summer months, local youth help to grow organic produce within the neighborhood, and bring surplus produce to sell at the market. In addition, in 2012 the SMFM received a USDA Farmers Market Improvement Grant to renovate the former fish market to serve as a small grocery store and education kitchen. Eventually, they plan to offer fresh fruits and vegetables most days of the week throughout the year. The advisory board will consider additional strategies, including having a local school club volunteer during market hours.

The analysis of spending patterns also provides evidence about market accessibility and suggests avenues for further investigation. Both frequent and less-frequent shoppers perceive SMFM produce as affordable and of high quality relative to grocery stores. The efforts of the advisory committee and staff to minimize operational costs likely play an important role here. The lack of association between shopper spending and income and the positive association with benefits-use support the conclusion that nutritional subsidy programs increase residents' purchasing power. One important factor is likely the enrollment of the market in the "Double Green$" program run by the Wholesome Wave Foundation, which provides up to US$10 weekly in additional market tokens to SNAP users. The positive relationship between spending and diabetes may reflect higher overall food expenditures or differential expenditures by this population in order to manage their chronic health conditions. If the latter is true, diabetic residents may prioritize spending on produce as a result of targeted nutritional education. A potential avenue for expanding participation in the market may be active collaboration with these education programs. Alternatively, it is possible that individuals from non-diabetic households procure more produce from other food outlets, although it is unclear what factor(s) would motivate this

differential spending. Additional research is needed to explore these findings.

These results also point to some potential ongoing barriers to participation in the market that staff and volunteers will need to address. Although income was not significantly related either to attendance or spending, a higher proportion of individuals attending for the first time the day of the end-of-season survey lived in low-income households. Ethnographic observations conducted by the research team support the conclusion that the US$10 grocery incentive was a significant draw to people who may not have felt able to attend the market in the past, though we did not advertise either the survey or incentive in advance of data collection. Interestingly, the majority of survey participants chose tokens for the SMFM over a gift card for the local supermarket chain. The negative association between shopping frequency and frequency of eating at restaurants may provide insight into priorities in food purchasing decisions. One potential explanation for this pattern is that consuming restaurant food, particularly from fast food chains, may be an efficient way to maximize calories given a limited household food budget. This helps explain why the density of fast-food restaurants is negatively associated with fruit and vegetable consumption (Larson et al., 2009). Our analysis provides no evidence for a relationship between income and eating outside the household. Alternative explanations are that people who work are both more likely to eat at restaurants and to be away during market hours, or that there are systematic differences between these populations in terms of either food preference or time available for cooking at home. The higher frequency of attendance among residents who drive points to potential barriers in terms of household socioeconomic status and mobility. Over time, market staff will consider the possibility of following the example of other markets in offering transportation subsidies to local organizations to bring residents to the site (George et al., 2011).

These results broadly support the conclusion that local perceptions of the market are very positive. This market appears to fill a niche in the city's alternative and local food system, in terms of serving residents of South Memphis who may be less likely to attend larger area markets and providing economic benefit to local producers. We argue that the involvement of the advisory committee in decision making and operation is critical to this success. Their on-the-ground appreciation of the practices, desires, and limitations related to the local food environment are often the focus of weekly advisory committee meetings and the basis for changes in the operation of the market. Perhaps as important, members of the advisory committee from the local community share their enthusiasm for the market with members of their social circles. During market hours they greet and socialize with shoppers and discuss produce-preparation techniques and recipes. They also assist farmers and shoppers; for example, carrying produce to cars and sometimes driving shoppers home with their goods. These activities make an invaluable contribution to the informal and friendly atmosphere of the market relative to other sites.

Our analysis also highlights the importance of continuing to work to keep prices relatively low and to attract SNAP and SFMNP shoppers. The market clearly had the largest economic impact for farmers in July and August, largely because of the high rate of SFMNP redemption. As the number of approved SFMNP vendors rises and shoppers are able to redeem their benefits at more city markets, SMFM may do a lower share of this business. One potential strategy might be to partner with local seniors' centers or residences to transport people to the market.

Patricia Allen (1999), in her exploration of both the potential benefits and limitations of community-based, entrepreneurial responses to food-system inequalities, concludes that food justice and prioritization of local food systems are not inherently compatible. Programs working to link local production and consumption with the needs of low-income communities are an important piece of the puzzle, but they are not, by their very nature, comprehensive, or free from market forces and fluctuations in grant funding (Allen, 1999). Federal social safety net programs remain essential for improving access to healthy foods among low-income communities. This conclusion is supported by our research on the SMFM. Although cash and credit and debit card sales

predominate, nutritional benefits programs clearly drive up levels of attendance and increase purchasing power. While the market might be able to succeed with fewer vendors should subsidy programs disappear, the potential nutritional and social impact of the market would be lessened, and economic stimulus to local producers would be reduced in their absence. An important potential avenue of collaboration for Shelby County Farmers Markets would be to develop a lobbying strategy to advocate for WIC FMNP participation, to further enhance and protect community health.

Limitations

The most important limitations of the analysis of the survey data relate to the sampling procedures. Although we asked all shoppers to participate, not all chose to do so. Similarly, the low number of respondents who said they used SFMNP may indicate that a slightly different population attends during and after voucher season. Participants may not constitute a representative sample of SMFM shoppers, or, more likely, the neighborhood as a whole. As mentioned previously, this strategy precludes understanding the barriers that prevent market attendance. Observations by the research team and members of the advisory committee who were helping to recruit survey participants suggest that response rates were very high. Related to this, some of the first-time shoppers may have been attracted to the market over those days specifically because of the survey. Two other limitations are the small sample size and limited statistical power, and the relatively high rate of missing responses. We did run a number of tests to determine if there are demographic differences between individuals who filled out all of their survey and those who left some of their answers blank; and although there was no indication of systematic bias, more information would be necessary to test this conclusion definitively. These limitations are balanced by our mixed-methods approach, and ability to contextualize quantitative with qualitative analysis. This exploratory analysis suggests a number of questions for future investigation.

Conclusion

A number of authors have argued convincingly that dietary decision-making is highly constrained by both household circumstances and neighborhood food environments (Drewnowski & Darmon, 2005; Kamphuis et al., 2006; Larson et al., 2009). The prioritization of the SMFM in a participatory neighborhood revitalization plan is a strong indication that residents are knowledgeable about national dietary guidelines and place a high value on nutrition. The aim of this paper was to explore data provided by market shoppers to draw conclusions about the accessibility of the market; and, by extension, about the value of SMFM as a neighborhood response to limitations in the local food environment, as well as to identify lessons that could be useful for other primarily low-income serving farmers' markets.

This analysis supports several conclusions. First, while nutritional benefits clearly increase purchasing power, most shoppers do not rely exclusively on these programs. Both nutritional subsidies and cash purchases are likely to be important for the long-term sustainability of the market. In addition, the market draws heavily from the local neighborhood, and shoppers are generally satisfied with the operation of the market. Thus, involvement of local residents in the planning and operation of the market and advertising strategies that build on informal networks, such as yard signs and fliers, will be important to increasing neighborhood participation. Finally, there may be evidence that individuals with chronic health problems prioritize spending on fruits and vegetables, or that their shopping patterns are systematically different in some other way. Harnessing this awareness through programs geared toward increasing their access to and intake of healthy foods could expand the market impact on residents' eating habits. Taken together, this is evidence that the SMFM is achieving the objectives of SoMeRAP and the SMFM Steering Committee to address the neighborhood food environment. Consistent with the findings of other investigators, the participatory origins of this market, along with the continued participation of residents in planning and operation, appear to be an important determinant of this success.

This analysis also supports the need for further investigation of potential barriers to attendance,

including hours of operation, lack of transportation, and limitations in household food budgets. Understanding how individuals and households confront food-related decisions on a day-to-day basis is critical to understanding the interaction of environment and household circumstances. The SMFM research team will build from these and other results to undertake (1) a systematic assessment of perceptions of the market through door-to-door surveys; (2) a longitudinal assessment of the impact of market participation on diet and body composition; and (3) an ethnographic exploration of the role of the market in individual and household choices.

Acknowledgements

We would like to thank all of the individuals who helped facilitate this research. This includes staff from The Works, Inc. and members of the SMFM Advisory Committee, especially Patricia Lacy, Karen Spencer McGee, Donna Owens, Rhonda Rucker, Curtis Thomas and Connie Binkowitz who provided invaluable feedback on research strategies and logistical support. It also includes the many students from the University of Memphis Anthropology and City and Regional Planning programs who helped substantially with data collection and the vendors and attendees who took time to answer our questions. Finally, we would like to thank two anonymous reviewers for their feedback on earlier versions of the paper.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Community food production as food security: Resource and market valuation in Madison, Wisconsin (USA)

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Submitted July 22, 2013 / Revised October 11 and November 26, 2013 / Accepted November 26, 2013 / Published online March 10, 2014

Citation: Smith, V. M., & Harrington, J. A. (2014). Community food production as food security: Resource and market valuation in Madison, Wisconsin (USA). *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 61–80. http://dx.doi.org/10.5304/jafscd.2014.042.006

Abstract

Community food production (CFP) is emerging worldwide as a key component of programming designed to address community food insecurity. CFP resources in the form of home gardens, community gardens, and school gardens continue to gain wide support and attention. However, the market value of gardening and garden-based programs as well as how this market value correlates to food-insecure communities are not yet well understood.

This research explores, defines, and maps this value in the Madison, Wisconsin, Urban Area (USA). The extent of CFP, including both the total number of gardens and their overall area within the study, was measured and mapped through the use of a random sidewalk and roadside survey of 2,454 addresses and existing lists of area community and school gardens. The productive output of these gardens in terms of weight, gross and net market value, and caloric value was determined through test plots (n=36) tended by citizen scientists and used to estimate the absolute and relative contribution of CFP for the Madison Urban Area in terms of market value and caloric value. The work concludes with a discussion of the current and future role of CFP as a component of community food security efforts and the need to carefully assess intended objectives and attributed values.

Keywords

community food production, community food security, community gardening, home gardening, urban agriculture

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Introduction and Literature Review

Urban and peri-urban agriculture (UPA) has expanded both nationally and internationally over the past two decades (Bellows, Brown, & Smit, 2003; Bruinsma & Hertog, 2003; Patel & MacRae, 2012). The United Nations Food and Agriculture Organization (FAO) reports that 70 percent of the world's urban population participates in urban agriculture in some form (FAO, 2010, p. 1); this produces 15 to 30 percent of the world's food supply (Johnson, 2013).

In the U.S. context, urban farming, community gardening, home gardening, and food share systems — all forms of UPA, if broadly defined — are frequently of interest not only because of *where* (Mougeot, 2000) they are practiced but *why* (Smith, 2011) they are practiced. The United States Department of Agriculture (USDA) refers to the practice of individuals and communities growing their own food as community food production (CFP), a term defined more explicitly elsewhere (Smith, 2011, p. 9) as "the act of growing food within a community, for that community, and by that community."

CFP takes place in both urban and rural environments and can be recognized by its specific emphasis on consumers participating in the act of production. Our research focuses exclusively on home gardening, community gardening, and school gardening within the Madison Urban Area (MUA). The phrase "community food production" is used throughout this paper to emphasize the forms of agriculture in which consumers actively participate in production. In the case of the MUA this emphasis excluded at least one large urban farm. Our focus is not intended to underemphasize the importance of urban farming, but to explore more fully the specific impact of gardening as a form of community food security.

The growth of CFP on the American landscape in the form of community gardens, home gardens, and school gardens has not gone unnoticed. Several municipalities across the United States have responded to the growth of CFP by adopting planning or zoning documents to facilitate or control its growth and placement (Mannion, 2009; Mendes, Balmer, Kaethler, & Rhoads, 2008; Mukherji & Morales, 2010).

As resources are consumed to plan for and to establish CFP, it becomes increasingly important to understand its role on the community. The value of CFP, or its potential lack of value, must be considered in a wide range of contexts. First, land use change, especially in urban and peri-urban environments, has the potential to impact and be impacted by a wide range of ecological systems, including air quality, water quality, stormwater runoff, solid waste streams, soil toxicity, urban water use, and wildlife habitat. Second, CFP is thought to have a wide range of sociological values for participants, including food security, workforce training, community enhancement, and economic development (Blair, Giesecke, & Sherman, 1991; Draper & Freedman, 2010; Ojo, 2009). These values vary widely and are just beginning to be understood (Lawson, 2005).

Community food security advocates have consistently raised the idea of CFP as a component of community food security (Bruinsma & Hertog, 2003; Meenar & Hoover, 2012). We define community food security as a condition in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance, social justice, and democratic decision-making (Hamm & Bellows, 2003). Emergency food providers, such as food pantries, are now planting their own gardens to secure fresh food, and many organizations and programs now exist for home gardeners and community gardeners to donate to food pantries or community kitchens. Community gardening has been at the forefront of CFP programs designed to impact food security. Community gardening organizations frequently identify food security as an objective and suggest that their gardens provide needed healthy fresh fruits and vegetables to food-insecure populations.

Whether community gardens actually serve food-insecure populations and whether the financial investment in community gardening is outweighed by its financial benefits are important considerations. For example, while CFP is often thought to benefit low-income families through its dollar value contribution, others have demonstrated that it is not a lack of money, but rather a lack of time, that serves as a barrier to fresh food for low-income households (Davis & You, 2011).

Still others have shown that community food programs such as community gardens are actually highly underutilized by the food-insecure populations they were designed to serve (Kirkpatrick & Tarasuk, 2009; Meenar & Hoover, 2012). Urban agriculture in its many forms remains highly contested as a component of food security infrastructure (Hallsworth & Wong, 2013; Weissman, 2013) at least in part due to the difficulty of assessing its market value.

The growth in CFP is thought to be a direct response to inadequate or unreliable access to food and a lack of purchasing power (Bruinsma & Hertog, 2003). In addition, international CFP development is expected to continue as the world population of urban dwellers and the population of urban poor continue to climb (Bruinsma & Hertog, 2003). The severe lack of food access has even led some to report that CFP is a "necessity" in urban areas of the global south (Eriksen-Hamel & Danso, 2010). The international push for urban agriculture or CFP is not surprising. Even in regions with short growing seasons and harsh climates, such as Nepal, CFP can meet 60 percent of a family's total fruit and vegetable needs (Gautam, Suwal, & Sthapit, 2009). Rooftop gardening, a specific manifestation of CFP, also has shown tremendous promise as a source of food security (Khandaker, 2004).

The value of CFP as a component of community food security is not restricted to the developing world, however. The USDA has published a standardized tool for community food security assessment that includes an assessment of "community food production resources" (Cohen, 2002). Interestingly, this assessment is based entirely on whether CFP resources exist rather than any assessment of agricultural production or distribution.

Advocates for CFP within the community food security community have asserted that anyone able to grow their own food or at least some portion of that food will save themselves the cost of purchasing that which has been grown (Brown, Bailkey, Meares-Cohen, Nasr, Smit, & Buchanan, 2002). In 2011 Americans were spending 9.8 percent of their disposable income on food (USDA, 2012); therefore a reduction in household food expenditures may substantially affect household disposable income.

The cost of one's time is frequently not considered in these arguments (Brown et al., 2002). For most home and community gardeners, labor costs are of minimal importance, but if gardening is to be viewed as having production value in its own right, these costs are of great importance. A gardener's time, however, is difficult to translate into a dollar figure. The assumption is clearly that the productive potential of CFP is a form of food security, but the question is more complex and involves a question of garden expenses, time spent gardening, or in short, an understanding of the production value of CFP.

If CFP is to be promoted as a community food security tool, a careful study of its agricultural and market contribution is important. Anecdotal reports that a single community garden produces over 50,000 pounds (22,680 kg) of food appears impressive, but perhaps not as impressive if that production represents only 1 percent of the total food needs of the growers in that garden. Careful exploration of the values attributed to CFP is clearly important. In discussing this need, Laura Lawson noted,

> The many outcomes associated with gardens have also attracted support from various organizations, including beautification groups, charitable organizations, government agencies, environmental groups, and neighborhood associations. The up side of this fact is that it allows programs to draw on many interests and resources. The down side is that the high ideals associated with gardens rarely can be documented or verified. (Lawson, 2005, p. 11)

Applied Research Methods

Site Selection

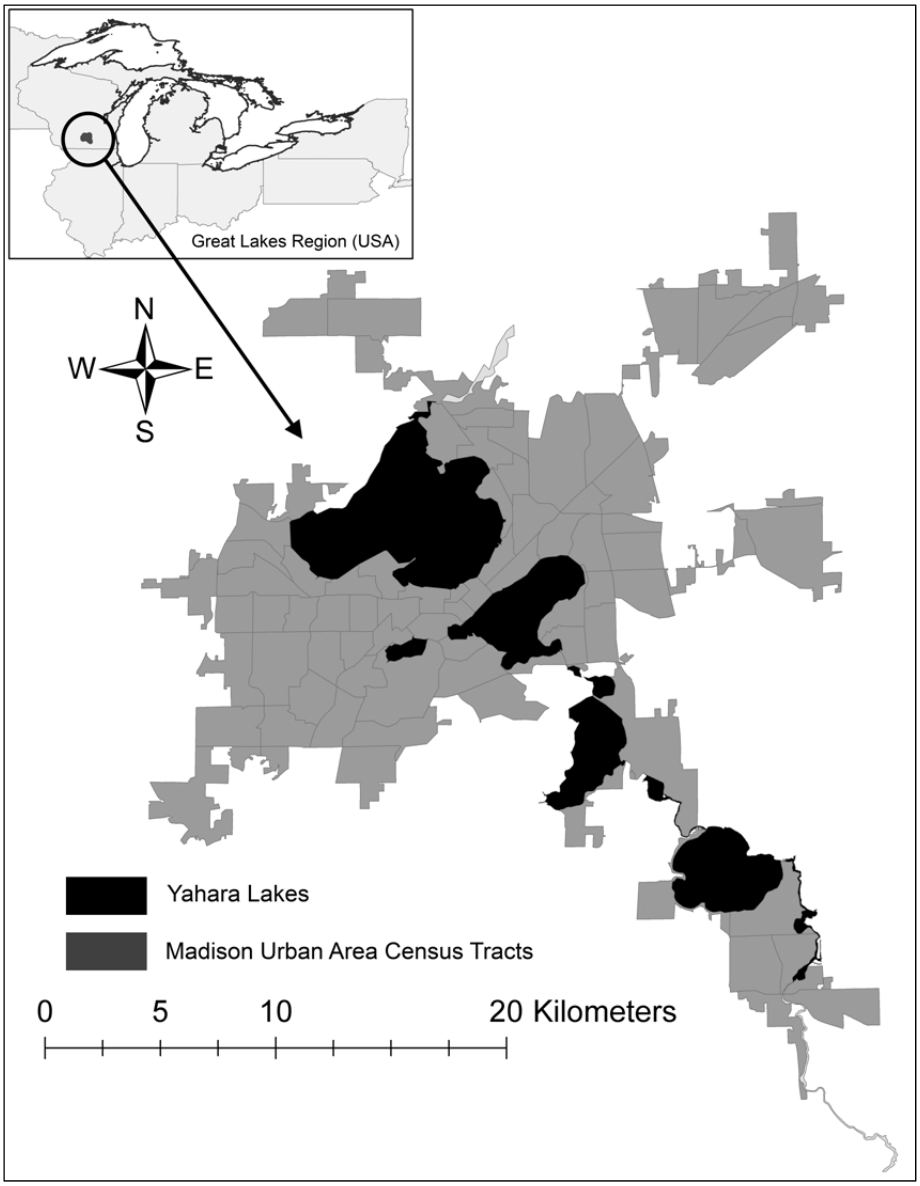
This research explores the potential value of CFP as a tool to combat community food insecurity in the MUA. Madison was chosen for this study for several reasons. With its rich agricultural history and substantial planning for community gardens, Madison is an appropriate location for a study of CFP. The urban area, located within Dane County,

is home to more than 40 organizations devoted to community food system design, boasts more than 60 community gardens, hosts the largest producer-only farmers' market in the United States, and contains more home gardens than would be reasonable for a person to count. The widespread investment in CFP and several nonprofit organizations' desires to assess and evaluate the value of that investment make the Madison area an ideal candidate for investigation.

According to the U.S. Census Bureau's definition of an Urban Area, the MUA consists of contiguous, densely settled census block groups and census blocks of at least 1,000 people per square mile, along with adjacent census blocks of at least 500 people per square mile that together encompass a population of at least 50,000 people (U.S. Census Bureau, 2012).

While the city of Madison composes a large portion of this urban area, it does not exclusively represent the urban area. Neighboring cities have developed alongside Madison, creating a single extensive urban area comprising 119 square miles (309 square km) of largely mixed residential land use. Figure 1 shows the study area in the context of the Upper Midwest region. Using Urban Area as a study boundary emphasizes inclusion of land use that is not primarily agriculture, but which has the potential to include agriculture in some form and on some scale as a complementary land use feature. Several other options existed for delineation of our study area, including metropolitan statistical area, urban planning area, and regional commuter network analysis. Our choice to use urban area was based our need to limit travel time and expense for survey teams as well as the need to have the area line up with census tract data. The use of a larger study area such as metropolitan statistical area would also

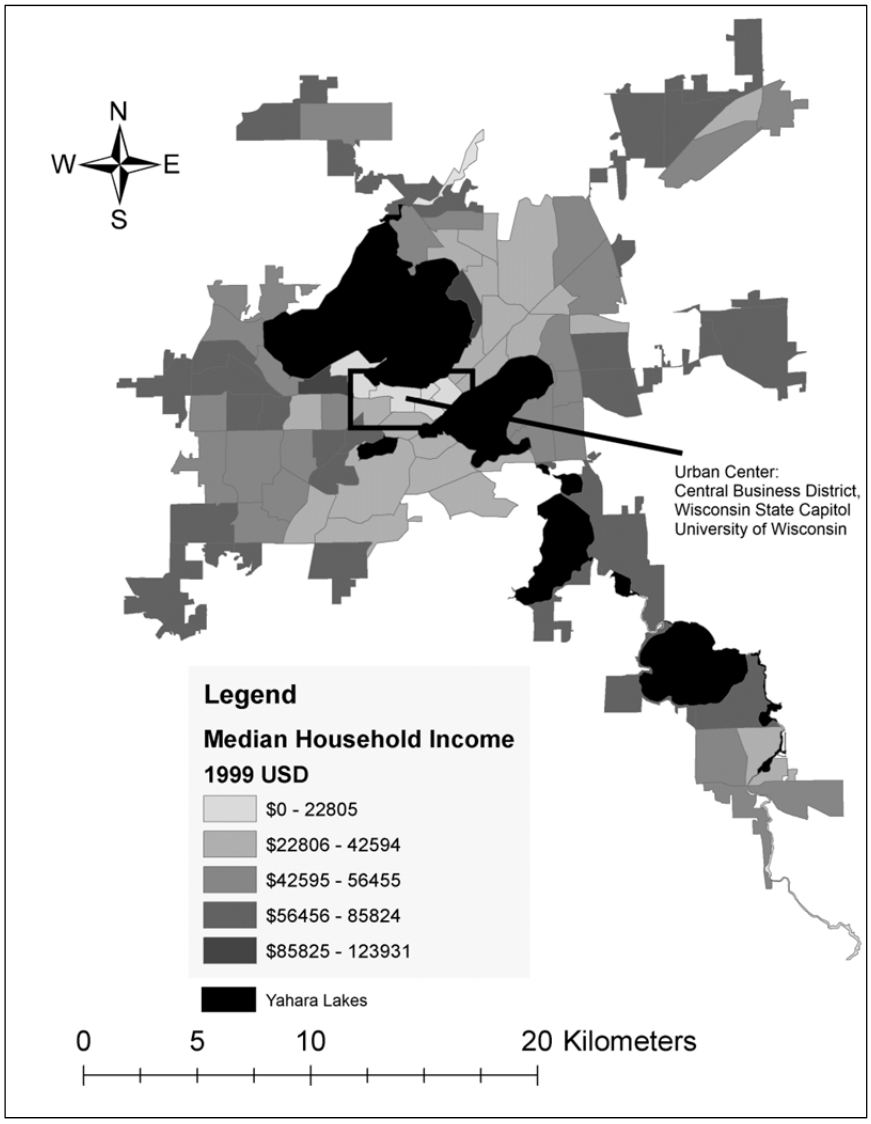
Figure 1. The Madison Urban Area (MUA) in the Context of the Great Lakes Region and the Yahara Lakes Chain (shown in black)



have been of interest, but would have required additional time.

The MUA contains part or all of 87 census tracts, or 5,019 total census blocks, comprising a total population of 346,496 individuals or 158,313 households as listed in the 2009 American Community Survey five-year estimates (U.S. Census Bureau, 2009). The estimated median household income across the entire MUA was US$54,057 in 2009. However, median household income broken down by tract was available only from the 2000 decennial census, which reflects 1999 income levels. In 1999 the median household income of the MUA as a whole was US$45,952. The median household income of census tracts ranged from US$10,258 to US$123,931, with quartile breaks at US$37,388, US$50,699, and US$61,912. Not unlike many U.S. cities, median household income was generally highest along the urban fringe where home and lot size are larger as shown in figure 2. Low median household income near the city center is likely correlated with the large number of University of Wisconsin-Madison students who live in this area.

Figure 2. 1999 Madison Urban Area (MUA) Median Household Income
Median household income of the MUA tends to increase as distance from urban center increases.



Spatial Configuration

Where CFP occurs within a community may influence its effectiveness as a form of community food security, who benefits from its potential value, and the trends in what may be motivating or limiting its practice. We captured the spatial composition and configuration of CFP in a geodatabase and analyzed them against tract-level median household income, percent of homes owned versus rented, and percentage of single-family residences (drawn from the 2000 U.S. Census).

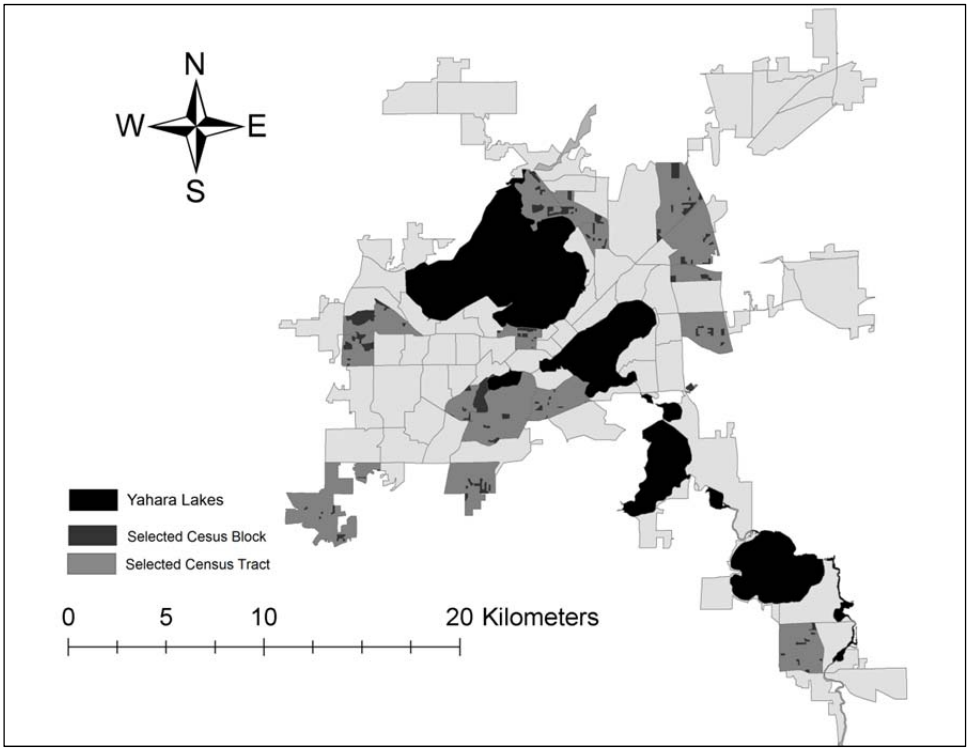
Mapping home gardens within the MUA has never been attempted, but as we began this study we estimated that the total number of home gardens in the MUA alone to be in the tens of thousands. We found the high-resolution orthophotos to be highly unreliable for identifying home food production. We therefore developed a novel process to determine home food garden presence and size. This pro-

cess included conducting a field survey of CFP gardens. Surveyors walked around neighborhoods and observed the presence of gardens in both front and back yards. Because this is a labor-intensive process and the MUA is quite large, we chose a subset of tracts.

We chose census tract as an aggregate because of the rich data set available. In addition, the number of census tracts within the area was a manageable size for investigation. We first assigned the 87 census tracts within the MUA to one of four household median income levels based on quartiles taken from the 2000 U.S. decennial census. We then randomly selected four tracts from each of these quartiles using a "sample" command in the statistical software program, "R." The resulting sample of 16 of 87 census tracts is shown in figure 3. We then used "R" to randomly select eight blocks within each tract. The order of blocks selected was retained as it was unknown whether time would permit a sample of all eight blocks from each of the 16 tracts. Any reduction in blocks being sampled would follow the order in which blocks were randomly selected in R.

Beginning in June 2010, we trained nine undergraduate researchers to identify food crops. Survey teams composed of three individuals recorded the presence or absence of food production at each address and parcel within the selected block by visual identification while surveying from sidewalks and roadsides. Teams did not go onto private property at any time. Teams were assisted by parcel and road maps of all surveyed blocks. The research group traveled together as one single unit for the first month of surveying to insure that plant identification skills were solid and data were entered consistently. The flat and open terrain within the MUA made identification of areas of food production possible. Of the more than 2,000 addresses visited, we were able to gain a full view of the parcel in every case. In the event that a single parcel contained more than one address, as was frequently the case for parcels with multifamily structures, each address was individually surveyed. In addition to garden presence or absence, survey teams identified the land use of the parcel grouped as single-family residence, multifamily residence, commercial, industrial, park, government, farm, or undeveloped land. Survey teams also identified the type of food production as either a dedicated food garden, food production integrated into ornamental landscape, or a container garden. Teams further estimated the total area of food production in square feet. We included fruit trees in our survey by

Figure 3. Madison Urban Area (MUA) Garden Sampling Design
A mulitistage random stratified probability sample was used to select census tracts (dark grey) and then blocks within those tracts (black) for analysis.



assigning each the estimated area of the tree crown.

Upon survey completion, we entered all data into a spreadsheet and joined it to a parcel shape file layer for analysis in ArcGIS, a geospatial analysis software program. We geocoded garden presence and garden size data by parcel and then aggregated each parcel by census block and census tract. We calculated garden presence in tract aggregates as a raw total number of gardens, and as a portion of gardens per population, per household, and per address identified in the survey process. Population and household estimates were drawn from the 2009 American Community Survey five-year estimate.

We then used the data compiled and explored in the sample to develop an estimate of garden presence in unsampled tracts throughout the study area. We used median household income, household type (single versus multifamily residences), and whether homes were owned or rented, as independent variables in single- and multivariable regression analyses. We explored all single-variable regressions as well as multivariate regressions. We used the best fit model to estimate garden presence in each of the 71 census tracts not sampled within the study.

We identified the presence of community and school gardens with the assistance of the local nonprofit organization Community Action Coalition of Southwest Wisconsin (CAC). The CAC maintains a list of all known community and school gardens along with contact information, garden location, and garden size (including number of plots, number of families served, and total area). Garden addresses were used to geocode a point layer of all gardens identified by the CAC located in the MUA.

The presence and size of home and community gardens were then analyzed against median household income as reported in the 2000 U.S. Census to explore possible patterns in gardening as a product of income. Initially gardening versus median household income was visually inspected using ArcMap. Simple linear regression models of garden presence against median household income, percent of homes owned versus rented, and percent of single-family residences, along with an analysis of variance of garden presence by income category, were used to measure the relationship between garden presence and selected variables.

Community Food Production Value

The quality and quantity of food produced by CFP are part of its many potential values (Butterfield, 2009). While agricultural production estimates exist for large field crops, no such estimates exist for small-scale agriculture or for mixed crop systems. Furthermore, actual production in CFP depends on a number of factors not typical of market agriculture, including the intent or objective of the grower.

While traditional "researcher-tended" test plots are useful in simulating production "potential," as a measure of actual CFP production levels these plots fail in that CFP production may be influenced by unobservable factors such as level of care or satisfaction, which are unknown. The lack of data on growing practices suggests the need to observe production from gardens tended and controlled by the gardeners themselves.

In the fall of 2009 we recruited a convenience-based stratified sample of gardeners. We identified 48 growers representing home gardens, community gardens, and school-educational gardens willing to participate in a year-long study of garden productivity. We asked all growers to join a "Madison Area Urban Agricultural Citizen Research Network" to assist in data collection. Such citizen research networks have been widely used in ecological research and have been shown to produce valid and reliable results (Cooper, Dickinson, Phillips, & Bonney, 2007). We then trained growers over the course of three months to record time spent gardening, garden-related expenses, harvest weights, dates of harvest, and items harvested. We also provided the growers with digital scales purchased through a graduate research fellowship from Annies Inc., spreadsheet templates, and a garden journal. The spreadsheet templates and garden journal were sent both electronically and in hard copy. The spreadsheet contained a column for each day of the growing season and rows for time spent, dollars spent, harvest weight of all likely food products, and empty rows for food products not identified. The garden journal was a simple Microsoft Word document template that was printed and then used in the garden to track date,

time spent, expenses, and garden tasks performed, including harvests. We asked growers to record all time and garden-related expenses beginning on January 1, 2010, through October 31, 2010. Growers recorded harvest data beginning on April 1, 2010. The assigned dates coincide with the growing season of the MUA.

We visited participating gardens periodically throughout the 2010 growing season both to record conditions generally and to record any variations in recording methods. Of the 48 growers originally identified to participate in the study, 36 growers completed the study. Reasons given for self-removal from the study included lack of time, relocation, and illness.

In order to estimate the market value of garden products from the weight of garden products, market prices were identified throughout the growing season. These prices were derived from 10 market visits over the course of the growing season and across several market venues. Venues included two conventional grocers, a specialty grocer carrying a large range of organic products, a food cooperative, and a farmers' market. During each of these visits we determined prices for all fruits and vegetables being sold and grown or likely to be grown in the Madison Urban Area. In addition, we identified prices for mushrooms, eggs, and honey, as these were known to be produced by urban growers in the area. We then calculated means and standard deviations for the prices of all products. In addition, we estimated calories by weight of all food items produced using the USDA's calorie estimation worksheet (Gebhardt & Thomas, 2002).

On October 31, we collected records from all participating growers. We entered data into a spreadsheet format from hand-written garden logs for those who chose not to use a computer for record-keeping. Total number of hours spent gardening, total expenses, and total garden area were recorded for each participating gardener. In addition, we determined the weight of each item harvested over the course of the season. From the above records, we calculated the gross value of food produced (raw and per square meter of garden), net value of food produced (raw and per square meter of garden), gross value of food per hour worked, and calories of food produced (raw and per square meter of garden).

We explored the possibility that garden type (home garden, community garden, or educational garden) influences garden productivity using the nonparametric Kruskal-Wallis test of difference. We also explored whether garden size has an effect on garden productivity by area. We used gross value of food produced per square meter and net value of food produced per square meter against garden size in a single variable regression to explore impact of garden size.

Though very few studies have explored small-scale production, Blair and colleagues' 1991 study of Philadelphia community gardens did quantify production. Their estimation of yield was based on expected yield per plant from data collected by Rodale Institute researchers, and then weighted by a potential yield estimate. This potential yield estimate was, in essence, a guess at how productive a garden appeared to be based on observations by horticultural experts (Blair, et al., 1991). The methods employed here are more labor-intensive and rely heavily on the assistance of citizen researchers, but assess actual yield rather than an estimated yield. Cleveland, Orum, and Ferguson (1985) estimated home garden productivity using observed harvest data but reported on only two home garden plots.

Our decision to utilize citizen researchers was based on the need to access private lands, the need for daily recording of personal data, and a desire to engage the community in research designed to impact that community. The increasingly human-dominated landscape demands approaches to ecological research that include the impact of private property. Citizen science is a clear way of including private landowners in research, thereby expanding research to include lands that might otherwise be inaccessible, or in this case, an entire land use (home gardening) that would be otherwise inaccessible (Cooper et al., 2007). Furthermore, citizen scientists also tend to lend legitimacy to scientific research for the general public and make that science accessible through their own story and information sharing (Couvet, Jiguet, Julliard, Levrel, & Teyssedre, 2008).

Estimating Community Food Production Resources

We used the relationship established in our regression analysis between garden presence and homeownership as well as average garden size to estimate the total area under production within our study area. We then estimated the agricultural productivity of the study area based on the production means from the citizen-science test plots. The result is an estimate of the total gross value, net value, and calories produced through CFP within the MUA.

The absolute contribution of CFP in terms of gross market value, net market value, and calories is of significant importance in understanding overall value. However, it is the relative contribution of CFP in comparison to total food needs that is most relevant to its role as a form of community food security. We calculated both the estimated total caloric needs of the study area and the estimated expenses on groceries to determine how the contribution from CFP compared to total need. Estimates of total caloric need were derived from the USDA's Food Intake Calorie Levels table (USDA, Center for Nutrition Policy and Promotion, 2005). The population in each age category within the MUA was taken from the U.S. Census Bureau's Community Survey (U.S. Census Bureau, 2009). We used these two data sets together to estimate the total caloric need of the MUA, accounting for age and gender. A similar analysis was conducted for food expenses using the USDA's Meal Plan Expenses estimation (Center for Nutrition Policy and Promotion, n.d.). The average monthly meal plan costs are given within the USDA's Meal Plan table for four different "meal plans." Estimated expenses were calculated based on the "moderate" meal plan. Estimates were again combined with census data describing MUA's population age and gender. The resulting data provide an estimate of the total expenses on groceries within the study area, accounting for age and gender. A comparison of the estimated total caloric need and grocery expenditures for the study area makes it possible to estimate the relative contribution of CFP in terms of market value and caloric value.

The methods we used here to calculate relative contribution to community food security are based on total food costs and total caloric need as a baseline. It may also be useful to calculate the relative contribution against a list of likely agricultural products, such as against the total cost of fruits and vegetables, as

Table 1. Home Garden Frequency and Mean Garden Size of Census Tracts by Ascending 1999 Median Household Income as Reported in the U.S. Census

Means are identified in bold for all census tracts sampled. Likelihood of participation in home gardening appears to decrease as median household income decreases.

Tract Median Household Income (US$)	Observed Gardens	Percent of Population Practicing	Percent of Households Practicing	Percent of Addresses Practicing	Mean Garden Area (m^2)[a]
$15,369	4	N/A	11	25	41*
$26,173	7	3	12	10	10
$34,210	32	14	30	31	8
$36,913	19	12	29	21	12
$40,104	52	13	30	25	8
$42,473	39	14	35	34	9
$44,896	27	6	14	17	10
$50,310	99	9	20	26	10
$52,500	23	2	45	47	7
$53,442	42	13	41	30	10
$56,026	30	14	35	30	14
$60,552	37	12	36	36	5
$66,810	46	14	38	26	11
$71,341	31	12	34	32	6
$79,035	60	10	31	28	15
$83,112	108	9	27	26	15
$50,829	**41**	**10**	**29**	**28**	**12**

* Based on four unusually large public gardens on or near a college campus
[a] 1 m^2 = 10.8 $feet^2$

has been calculated in a past study (MacRae et al., 2012). We chose not to calculate relative contribution in this way due to the difficulty of determining the "appropriate" market value and caloric contribution of fruits and vegetables relative to total dietary needs.

Results

Garden Presence

The raw number of gardens found within each tract, the average size of gardens, and the ratio of gardens to population, households, and addresses are outlined in table 1 and described visually in figures 4 and 5. The raw number of gardens identified was far greater than originally anticipated but consistent with national estimates of home food production estimated by the National Gardening Association (Butterfield, 2009).

Census blocks are based on neither population nor area. Thus the raw number of home gardens identified does not adequately characterize the propensity for gardening in a block due to variation in block area, population, and number of households in each block. Therefore, we used "gardens per household" to communicate the degree to which CFP

Figure 4. Sampled Home Garden Presence
Total number of sampled home gardens tends to increase with distance from urban center.

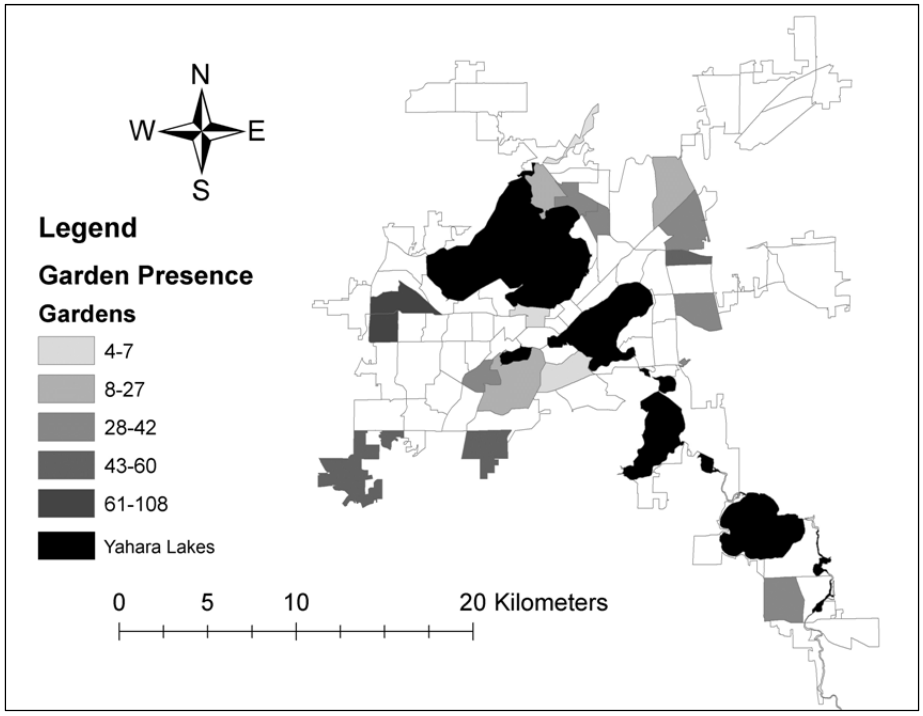


Figure 5. Percent of Households Participating in Home Gardening
Sampled percent of households participating in home gardening tends to increase with distance from urban center.

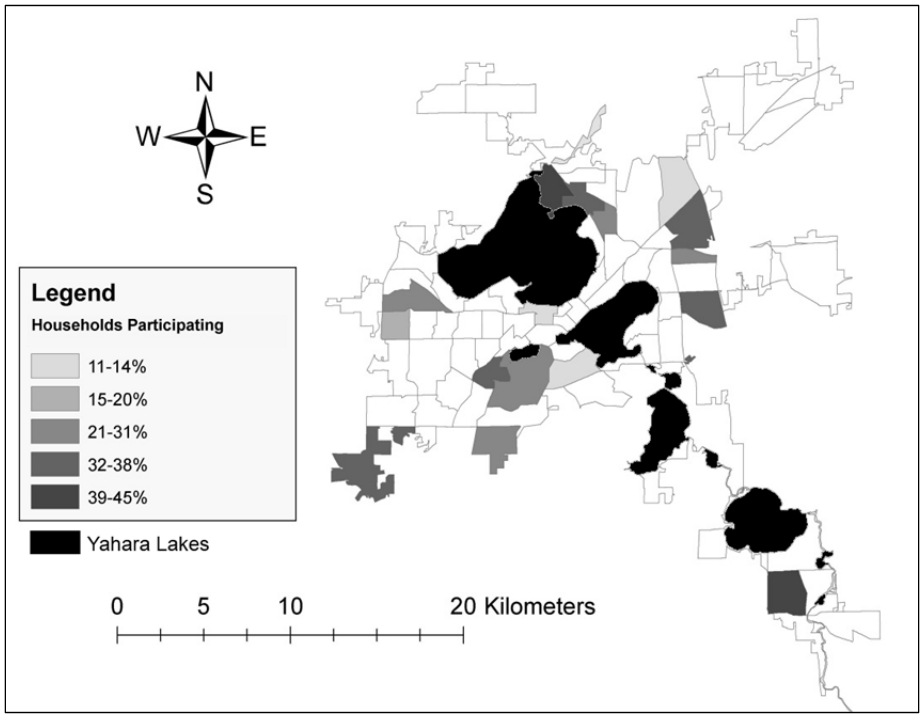
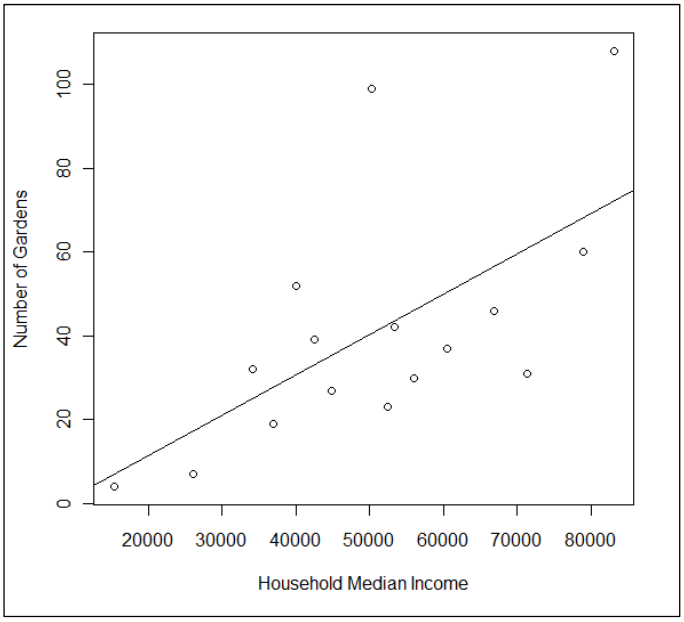


Table 2. Results of Linear Regression Models of Garden Frequency Versus Tract Characteristics
The resulting fit of the model vs. observed data in sampled tracts is additionally shown. All variables have a positive linear relationship with home garden participation.

Model	R squared	F statistic	P value
Income	0.219	5.211	.039*
Ratio Single-Family Unattached	0.291	7.147	.018*
Ratio Homeownership	0.358	9.354	.009*

* Statistically significant

Figure 6. Scatter Plot and Fitted Line of Garden Presence as a Product of Tract-Level Median Household Income
Home garden presence increases as household median income of census tract increases.



was practiced in a block. The number of households participating in gardening was used as a realistic quantifiable estimate of the degree to which gardening is utilized within a community. Gardens per population followed a nearly identical trend, but less clearly illustrate the likelihood of a household unit to garden, as household size varies across the landscape. Gardens per address sampled appeared almost identical to gardens per household but additionally captures land use types on which gardens were unlikely to be found.

The degree to which gardens occur on commercial or industrial land was difficult to determine due to a lack of commercial or industrial land uses within the sample set and very low garden observations on these land use types. "Gardens per household," therefore, was deemed the best indicator of the likelihood of a community to garden. The ratio of "gardens per household" was translated into percent of households participating for ease in reporting.

Estimating Home Garden Frequency

We used sampled data to estimate the number of home food gardens across the study area. Based on observation during the surveying procedure, gardens appeared more frequently as income increased. The regression analysis shows home garden presence to be correlated with median household income, ratio of single-family unattached homes, and ratio of homeownership over rental, as shown in table 2. These three highly correlated demographic variables all have statistically significant linear relationships with the presence of home gardens per household.

Although we explored single-variable regressions as well as all combinations of multivariate regressions, a simple single-variable model using homeownership best estimates gardens per household. A similar study in 1983 also noted that community characteristics, including income and whether the home was rented or owned, best predicted the decision to grow food at home (Blaylock & Gallo, 1983). Though homeownership best estimates gardens per household, median household income as a correlate of homeownership is often useful to understand garden presence and is shown in figure 6.

The resulting model of gardens per household indicates that the number of gardens per tract range from 162 to 1,196, and the percent of households participating in home gardens ranges from 15 percent to 41 percent across the study area, as shown in figures 7 and 8.

The positive correlation between home garden presence and median household income is visually depicted in figure 9. This configuration is opposed, in many ways, to the present configuration of community gardens as shown in figure 10, which historically have been located in census tracts with low median household incomes. The presence of community gardens in lower-income census tracts, however, is not specifically an indicator of gardener income as it is unclear where gardeners in these community gardens live. Nevertheless, the results of self-reported questionnaires (Smith, 2011) suggest that community gardens serve a lower-income population than do home gardens.

Harvest Data

The 36 citizen scientist gardeners completing the study recorded daily harvest data, expense data, and time data under researcher direction. Seasonal results are reported in table 3.

A Kruskal-Wallis nonparametric analysis of variance showed no significant differences in production between garden types. All garden types (home, community, educational) had similar production levels per area. The produce weight per square meter reported was based on the weight of washed and trimmed product. In most cases, this referred to fresh fruits or vegetables,

Figure 7. Estimated Number of Home Gardens by Census Tract
Garden presence increases as distance from urban center and median household income increase.

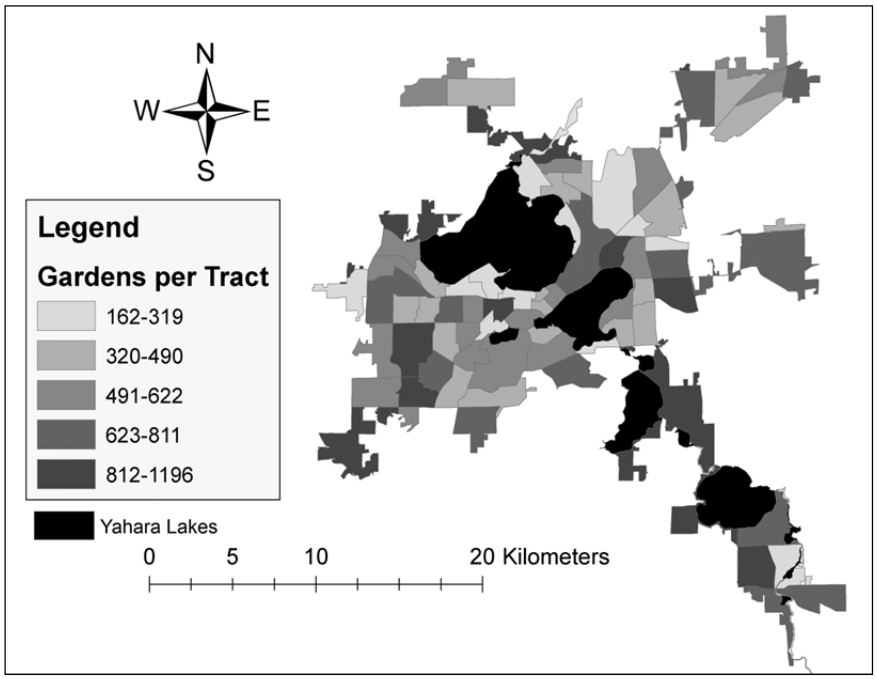


Figure 8. Percent of Homes Participating in Home Gardening by Census Tract
Percent of households participating increases as distance from urban center and median household income increase.

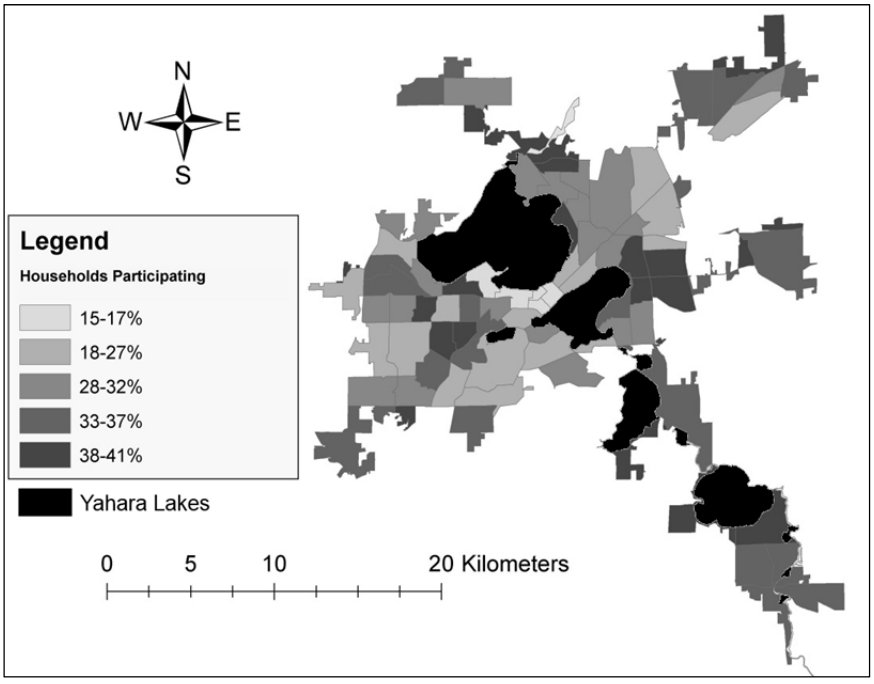
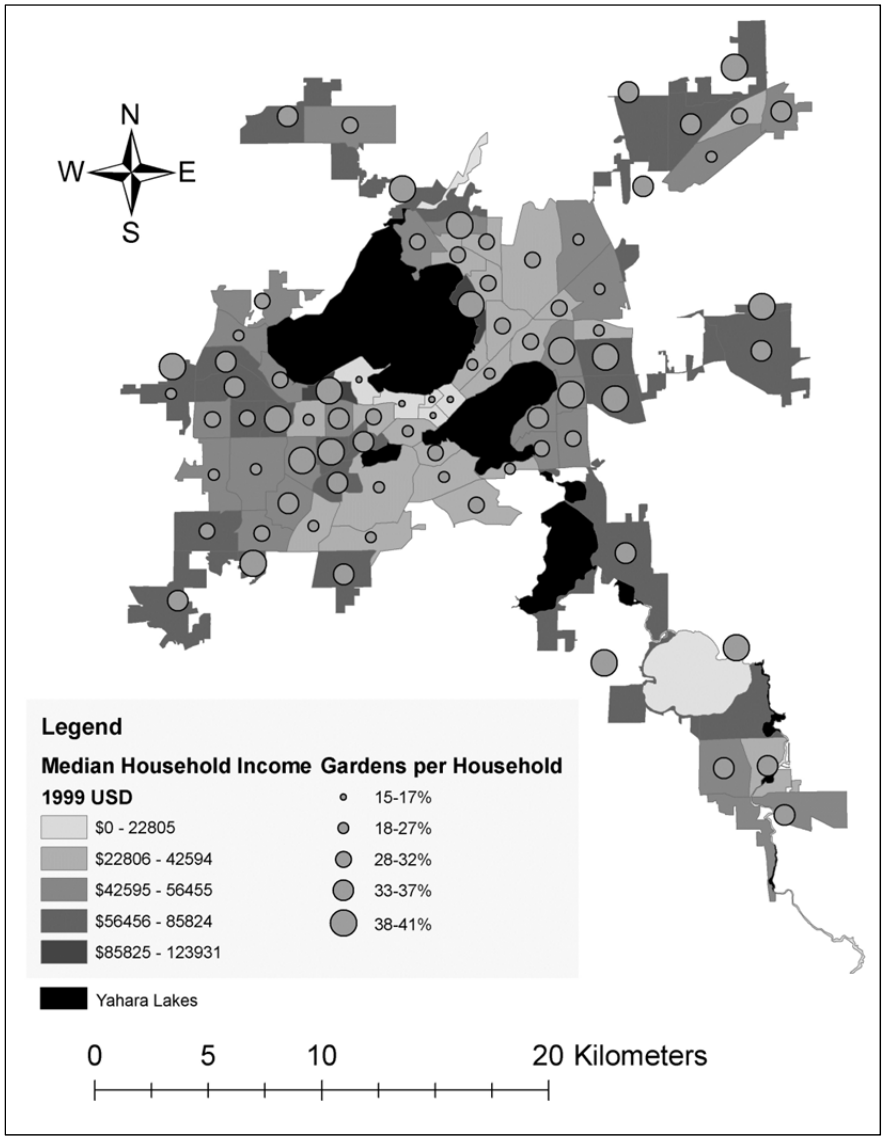


Figure 9. Home Garden Participation with Median Household Income by Census Tract
Likelihood of participation increases as median household income increases.



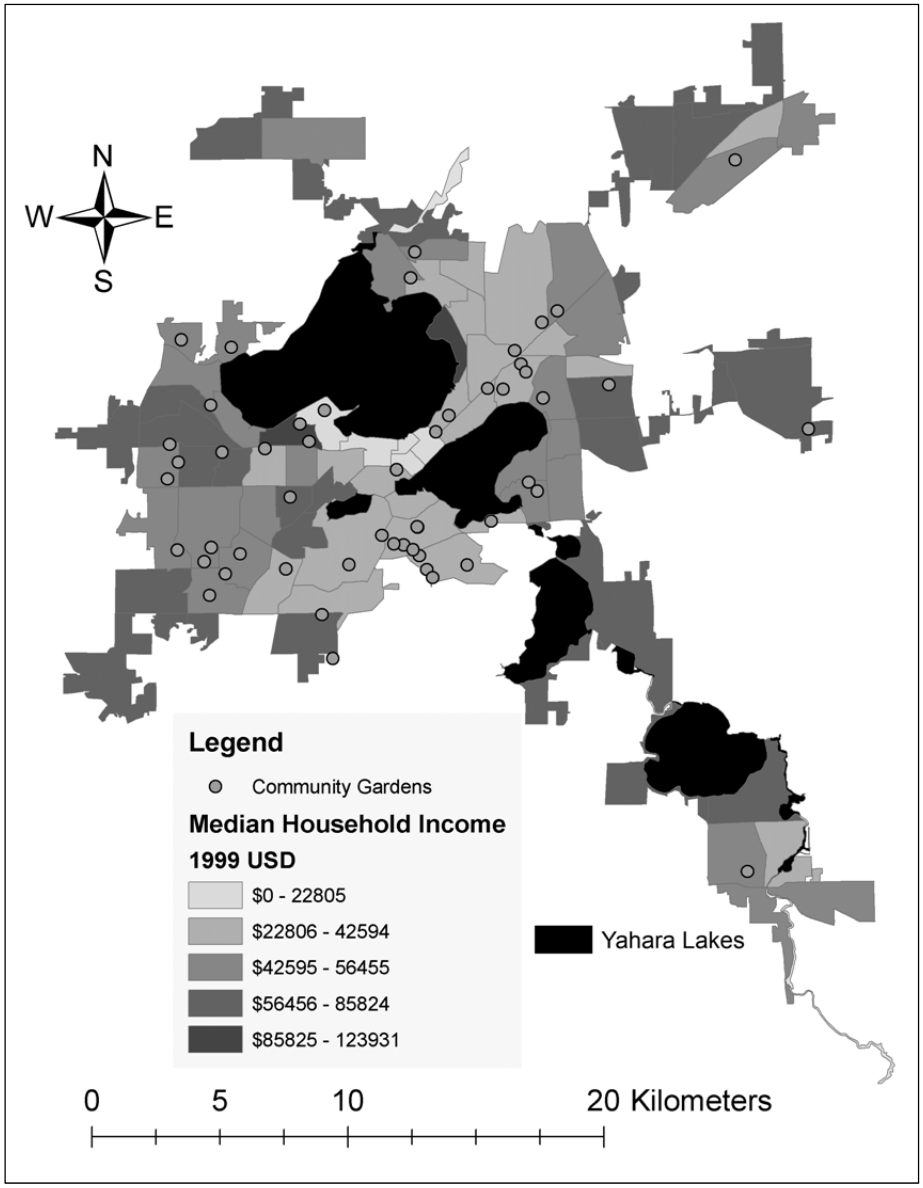
although some gardeners additionally reported production of mushrooms, eggs, and honey. Calorie values were derived from the calories per gram weights recorded in the USDA's caloric estimation for use in food labeling (USDA, Agricultural Research Service, n.d.) and then converted to calories per kilogram. Though these estimates are known to vary with growing conditions, soil, and variety, they represent the best estimate of caloric output of these gardens.

Extrapolating Harvest Data

By extrapolating the production data of the 36 test plots to the CFP resources identified through surveying, we were able to estimate all CFP production resources in the MUA. This estimate is based on the total actual number of known community and school gardens and their known sizes. In addition, it is based on the sample estimate number of home gardens and mean sample size. The mean production value for each of these production types is then drawn from the test plot samples and applied to the area as a whole in table 4.

Though the absolute number of CFP resources and their resulting caloric and dollar values are high, the relative contribution of these resources in terms of total food expenses or caloric need is quite low. Based on an estimate of food expenses drawn from the USDA meal plan expense chart (USDA, Center for Nutrition Policy and Promotion, n.d.), the total estimated annual cost of food purchases for the MUA totals US$11,903,176,861. Therefore all CFP resources combined contribute .08 percent of the area's annual food expenditures. As an estimate of total caloric need for the MUA (272,627,175,174 calories) (Center for Nutrition Policy and Promotion, 2005), that number increases to .14 percent. As noted above, these estimates were determined by calculating both caloric need and estimated expenses by both age and gender for the study area as a whole. Population structure was calculated based on the 2009 Community Survey five-year estimate.

Figure 10. Community Gardens with Median Household Income by Census Tract
Community garden presence appears distributed across median household income; however, many appear in areas of low median household income.



Discussion

Thirty-three percent of households in the Madison Urban Area participate in CFP in some way. This is consistent with data collected by the National Gardening Association, which estimates that 31 percent of all U.S. households, or an estimated 36 million households, participate in CFP each year; this number continues to climb each year (Butterfield, 2009). However, this research suggests that the frequency of this practice is related to demographic and household variables, such as median household income, as has been found in similar studies (Meenar & Hoover, 2012; Mirsch & Dimitri, 2012). For some Madison neighborhoods, the proportion of households gardening is as high as 41 percent. In other areas, however, that proportion is much lower (15 percent of households). Household income, whether a home is a single-family unattached house, and whether the home is owned or rented all inform whether a home garden will be present. CFP increases with household median income, homeownership, and unattached homes as shown in table 2 and figure 6. We limited our use of regression analysis in this study to provide a simple estimate of how CFP impacts community food security. More robust regression models could be developed using demographic variables to better predict likelihood of garden presence in a specific area. Our findings here are meant to help generally quantify CFP contribution.

In total, there are an estimated 45,193 home food-producing gardens in the Madison area totaling 491,219 square meters (5,287,437 square feet). The average home garden size was 12 square meters (129 square feet), suggesting that for many, especially for apartment dwellers, these gardens are

Table 3. Productivity of CFP Resources Aggregated by Resource Type Shown with Kruskal-Wallis p-Values of Variance Between Aggregation Types

	Kg/ m²	Dollars/ m²	Dollars/ Hour	Net Dollars/ m²	Hours/ m²	Calories/ m²
Home Gardens (n=13)						
Mean	2.13	15.79	17.01	11.65	1.06	627.99
SE	0.51	3.71	3.13	3.15	0.34	112.82
95 CI	1.12–3.12	8.51–23.03	10.86–23.15	5.49–17.86	.43–1.72	406.84–849.07
Community Gardens (n=14)						
Mean	2.06	15.19	13.58	13.05	1.43	742.30
SE	0.34	2.11	2.36	2.10	0.14	144.82
95 CI	1.42–2.73	11.08–19.36	8.96–18.21	8.93–17.22	1.18–1.72	458.27–1026.29
Educational Gardens (n=5)						
Mean	1.40	8.13	11.57	5.27	1.06	457.29
SE	0.22	3.95	1.84	4.37	0.29	233.56
95 CI	.98–1.85	.44–15.81	7.97–15.18	–3.34–13.88	.54–1.61	0–915.03
All Gardens (n=36*)						
Mean	1.91	13.79	14.31	10.68	1.26	619.79
SE	0.05	1.82	1.59	1.60	0.15	75.91
95 CI	1.45–2.39	10.22–17.32	11.20–17.43	7.53–13.77	.97–1.61	471.07–768.59
Kruskal-Wallis p-value**	0.35	0.27	0.37	0.32	0.21	0.45

* Total includes 4 plots reporting on both home and community gardens
** No significant differences were detected between garden types

nothing more than a few potted plants or a row of beans running along a fence. For others, however, the gardens are much larger — as large as 400 square meters (4,306 square feet).

Community gardens and school gardens are also found throughout the area, and their placement is also related to median household income, although in this case they are found more frequently in areas with lower median household incomes (see figure 10). Community gardens, particularly older ones, tend to exist in precisely the opposite locations as home gardens. However, unlike home gardens that are tended by on-site residents, it is unclear whether members of a community garden live in the community in which that garden is located. Several community garden registrars report residents traveling from outside the neighborhood to garden. Several community gardeners interviewed in this study lived 30 minutes or more by car from the community garden (Smith, 2011). They chose the community garden based on proximity to a major road used in their daily commute to and from work.

There are 52 known community gardens and school gardens in the area, totaling 2,991 total plots or 110,551 square meters (1,189,961 square feet). Community gardens and school gardens represent only 6.2 percent of the total number of gardens, but they represent 18.4 percent of the total land area of CFP. The mean size of a community garden plot tends to be much larger than a home garden. This is due to the fact that home gardens in this study were defined as any food production at the home regardless of size. Many of these gardens were only a few potted plants on a balcony.

There are a total of 48,184 CFP resources (gardens) in the Madison area covering 601,770 square meters (6,477,398 square feet). As a whole, CFP resources in the area gross US$13.79 per square meter, net $10.68 per square meter, and produce 1.91 kg per square meter. This appears to be consistent with what other researchers have

found. For instance, Doiron (2009) found that a home garden could produce US$1.50 per square foot (US$16.15 per square meter). In the arid U.S. Southwest, home gardens were found to net between US$109 and US$123 per year, or to produce between 1.24 and 2.31 kg/ square meter (0.25 and 0.47 lb/square foot) (Cleveland et al., 1985). Finally, the National Gardening Association's 2009 national report estimated CFP to produce 0.5 pounds per square foot (2.42 kilograms per square meter) at an estimated US$2.00 per pound (US$4.41 per kilogram) or US$1.00 per square foot (US$10.60 per square meter) (Butterfield, 2009).

Table 4. Estimated Community Food Production Value for Madison Urban Area Overall Based on Models of Garden Presence and Extrapolated Production Rates
Results indicate a substantial absolute contribution, but a relatively low contribution relative to need.

	Home Gardens	Community Gardens	Total Gardens
Gardens	45,193	2,991	48,184
Area of Gardens (m^2)	491,219	110,551	601,770
Weight of Food (kg)	1,048,942	227,857	1,276,799
Gross Value (US$)	$7,761,044	$1,679,761	$9,440,806
Net Value (US$)	$5,724,179	$1,442,997	$7,167,176
Calories	308,600,666	82,094,530	390,695,196
Percent of Total Food Sales [a]	0.07%	0.01%	0.08%
Percent of Caloric Need [b]	0.10%	0.03%	0.14%

[a] USDA Meal Plan Expense Chart (Moderate Meal Plan) (USDA, Center for Nutrition Policy and Promotion, n.d.).
[b] USDA Food Intake Calorie Levels (Adjusted by age of population) (USDA, Center for Nutrition Policy and Promotion, 2005).

The latitude of Madison, Wisconsin, is 43 degrees North. According to the Wisconsin State Climatology Office, the median length of the growing season between 1971 and 2000 was 147 days, which is lower than for much of the United States. Though the length of the growing season alone is not an accurate measurement of agricultural productivity potential, it is important to recognize that the location of our study area plays an important role in interpreting our results.

In all but two cases in this study, the CFP practitioners experienced positive net returns on their investments. In most cases the return on investment was relatively high. In terms of net market value of food produced per hour spent on CFP, the mean dollar per hour return was US$14.31. Table 3 breaks down the productivity of CFP by home gardens, community gardens, and school gardens by way of illustration. However, the differences in production between these garden types are quite small and not statistically significant.

Conclusions

The 48,184 gardens in the Madison Urban Area contributed a gross agricultural product of US$9.4 million in 2010. In terms of net production, that is US$7.1 million. The absolute contribution of these gardens, however, whether measured in pounds, dollars, or calories, is not enough evidence alone that CFP is playing an important role in food security. Organizations have a tendency to publish this kind of data with bountiful pride and argue that they have solved food insecurity. With over 300,000 people in the Madison Urban Area, the substantial absolute contribution of food through CFP amounts to .08 percent of the total food needs in terms of dollars or .14 percent of total caloric need.

The percentages of total caloric need and food expenses listed here are for the Madison Urban Area as a whole. However, it is additionally helpful to understand how much of a CFP practitioner's average food expenses or caloric need are met through his or her participation in CFP. In this case, the estimated percent of food expenses provided by CFP for practitioners is 2.4 percent. The actual present contribution and the contribution potential, however, are quite different due to substantial variation in garden size. The largest home gardens in this study, for example, were

actually producing more in terms of both dollars and calories than the household would have needed. Though these households were still purchasing some food items, in terms of dollars and calories they were self-sufficient from their backyard garden alone. Most individual households do not have the yard space or time to produce at this level, but the potential for CFP as a meaningful contributor to the total food supply does exist.

The relative versus absolute contribution of CFP is important in assessing the role of CFP as a component of community food insecurity. From the community or regional perspective, the current contribution of CFP is relatively small. However, from the perspective of the individual or household participating in CFP, market value and/or caloric contribution can be a substantial component of food security. For example, even a garden as small as the average 12.5 square meters or 135 square feet (the mean for all garden types) returns over US$100 in food per year. Some may find this value meaningful, but others may not find that US$100 is worth the time or initial investment.

This discovery, that the contribution of the food itself is quite small, is not entirely novel. Others have found the same, including community food security advocate Mark Winne, who argued,

> A little patch of green sprouting in an otherwise unforgiving urban landscape is desirable for many reasons, not the least of which is the relief it gives the eye. But… Hartford's community gardens have made only a marginal contribution to the city's food security, with the exception of a relatively small number of ardent gardeners who have significantly augmented their food supplies. (Winne, 2008, p. 57)

The case of Madison seems to be similar to Hartford; the food itself is making only a small contribution in terms of the community's overall food security. However, the market value and caloric contribution of CFP per unit area suggests that the potential for CFP to contribute meaningfully to community and household food security is substantial. Findings here are consistent with similar research in Toronto that has suggested the need for scaling up production to meet food insecurity demands (Patel & MacRae, 2012).

Further research is likely necessary to quantify the current market value of CFP in other municipalities or regions as well as the potential role of CFP in the future. Employing the methods described here on a regular basis would be both time-consuming and costly. However, as CFP expands it will be necessary for regional food system planners to consider the rigorous methods employed here on a periodic basis to better understand the overall growth of CFP and its spatial distribution.

Our attempts to simplify identification of CFP through the use of aerial photography proved unsuccessful due to the current resolution of imagery. Any future attempts to utilize aerial or satellite-based imagery will need to depend on image resolution and data processing power beyond that which is currently regularly available. Furthermore, our research suggested that even well networked community leaders and neighbors were unable to identify where food production was taking place within a neighborhood with which they were highly familiar. This again suggests the need to resist attempts to simplify data collection procedures by relying on key informants if reliable food production data is needed.

The limited extent to which CFP is currently contributing to municipal and/or regional food demands is unlikely to warrant the level of research investment employed here throughout urban areas broadly. However, if program-level or site-specific data is needed, use of the methods employed here may be highly beneficial. Better understanding the current contribution of individual community gardens, urban farms, and even backyard gardens will be necessary to model the future potential of CFP to contribute to food security; this potential was demonstrated here by virtue of the high productivity of specific CFP resources.

The limited contribution of CFP at the municipal and/or regional level relative to its potential as a source of food security suggests the need for further research to explore the current barriers to participation. This same recommendation was additionally reported in research in

Toronto (MacRae et al., 2012). Better understanding the social, political, and environmental factors limiting production and expansion of CFP will be necessary to plan for or develop future resources. In addition, a continued focus on social and geographic distribution of resources will be necessary to measure the extent to which expanded resources meet the needs of intended audiences.

Our research lends clarity to the ongoing debate about whether urban production may serve as a form of community food security by quantifying the relative and absolute contribution within one region. Further quantitative research will be needed to extend the results of our research nationally or internationally.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Beyond the farmer and the butcher: Institutional entrepreneurship and local meat

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Submitted August 23, 2013 / Revised November 7, 2013 / Accepted December 3, 2013 / Published online March 6, 2014

Citation: Gwin, L., & Thiboumery, A. (2014). Beyond the farmer and the butcher: Institutional entrepreneurship and local meat. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 81–96. http://dx.doi.org/10.5304/jafscd.2014.042.007

Abstract

Increased demand for local food has led to calls for additional supply-chain infrastructure to move products from farm to market. Meat and poultry are highly perishable, rigorously regulated products that require a complex chain, and processing is often said to be the weak link for local meats. Commitment from producers and meat buyers is essential to the persistence and expansion of processing capacity, but nonmarket actors can provide critical technical support and facilitate innovation that strengthens this sector. We present four collaborative efforts, three regional and one national, that focus on processing with the goal of expanding the local meat sector. These efforts harness the experience and expertise of a variety of partners, both public-sector and private, and provide information, guidance, and direct technical assistance. They also collaborate and cooperate with each other in a national peer-learning community, sharing and generating innovative knowledge, tools, and strategies. Tentative evidence of increased processing capacity, producer access to processing, and local meats marketing, while certainly not solely attributable to these efforts, suggests their value.

Keywords

institutional entrepreneur, local food systems, local meat processing, local meats, local poultry, professional structures, reference networks, small farms, small meat processors

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Author note: The authors founded and coordinate the Niche Meat Processor Assistance Network (NMPAN), discussed in this article. NMPAN is a community of practice through eXtension.org, the online presence of the land-grant university system, and is housed at Oregon State University. Earlier versions of the case studies in this paper were published by the authors under a cooperative agreement with the U.S. Department of Agriculture Economic Research Service.

Introduction

As demand for local food grows (Low & Vogel, 2011; Martinez et al., 2010), those involved with bringing it to market point to a need for additional post-farmgate infrastructure (Bloom & Hinrichs, 2010; Buck, 2011; Cantrell & Lewis, 2010; Morley, Morgan, & Morgan, 2008; Western SARE, 2013). Meat and poultry, as highly perishable products, require a complex and rigorously regulated supply chain, and processing is often said to be the weak link (Food and Water Watch, 2009; Fromartz, 2012; Zezima, 2010). Facilities may be located far from farms and ranches, have limited availability during peak livestock finishing periods (especially the fall for ruminant livestock), or lack the inspection status, skills, or services desired by producers. Yet meat processing is a high-risk, thin-margin business, and small processors often lack the steady, consistent business needed to be profitable while providing high quality, customized services (Gwin, Thiboumery, & Stillman, 2013; DeHaan, 2011; Lewis & Peters, 2011; Raines, 2011).

Strengthening this link in the chain to allow more local meat to flow to market requires commitment from livestock producers on one side and meat buyers (end consumers or the retailers, restaurants, food service, and others that sell to end consumers) on the other to provide the steady business — enough livestock, enough of the time — that processors need for financial viability. Processors are then able to commit to providing high quality services and expanding capacity to meet producer needs (Gwin, Thiboumery, & Stillman 2013). Without such commitments, the processors necessary for local meats to get to market will struggle to persist, let alone to expand capacity.

However, asserting that market actors and business commitments are essential to filling apparent infrastructure gaps to bring more local food to market is not the same as saying "the market will sort it out." On the contrary, our research on innovations in local meat and poultry processing suggests that *non*market actors — individuals and organizations, typically but not exclusively from universities, public agencies, and nongovernmental organizations (NGOs), who provide external support for market actors and transactions — play an important role in bringing more local meat and poultry to market. Nonmarket actors foster innovation by facilitating connections and peer-to-peer learning not only between livestock producers and processors but all along local meat supply chains. They also learn from each other, pulling and adapting innovations from one region to another, generating new knowledge and approaches as they go.

This paper examines the role of such nonmarket actors in creating and strengthening communication, collaboration, and coordination related to processing as a link in local meat and poultry supply chains. We present data from case studies of four collaborations, three regional and one national, involving public- and private-sector partners, that provide information, guidance, and technical assistance related to local meats processing. Their focus on processing occurs within a farm-to-plate context: efforts to shore up and expand processing capacity are motivated explicitly by the goal of allowing more livestock producers to bring more local meat and poultry to more consumers. We use three useful concepts — professional structures, reference networks, and institutional entrepreneurship — to frame our discussion of these collaborations, their current accomplishments, and their potential. Tentative evidence of increased processing capacity and producer access to processing, while not attributable to these initiatives only, suggests their value. They not only provide valuable support and technical assistance but also appear to be transforming how local producers and their processors work together and, further, how agencies and organizations do the work of building and strengthening local meat and poultry supply chains.

In the rest of the introduction, we explain our research methods. In section two, we draw on existing theories of innovation and knowledge generation as a framework for our empirical data, which we present in section three. In section four, we revisit our framework and conclude with recommendations for practitioners and suggestions for future applied research.

Methods

The data and analysis presented here are part of a

larger research project on barriers, innovations, and opportunities related to local meat and poultry processing. This paper draws on several sources of empirical data. We conducted multiple interviews by phone and in person from 2009 to 2013 with eight people with central leadership roles in the three regional collaborations discussed here. Interviews were semistructured, allowing room for emergent topics of interest and relevance. Questions focused on the collaboration's history and motivation, goals, structure, participants, activities, and accomplishments. (All quotations in this paper are from the interviews, unless otherwise noted.) We supplemented interviews with follow-up email and phone conversations to clarify and update information; analyzed written reports and other materials generated by these collaborations as part of their processing-related work; and attended and participated in initiatives designed and implemented by all four collaborations (advisory-board conference calls and in-person meetings, two regional conferences, conference presentations, and a technical assistance project). The paper, specifically the section on the national network but also more generally, is also informed by years of participant observation. We have worked on this issue for more than a decade each, as graduate students, extension professionals, academic researchers, and processing plant personnel, and together founded and coordinate the Niche Meat Processor Assistance Network (NMPAN), described here. We do not suggest that our data and analysis represent all nonmarket support related to small processors or local meat and poultry. We also do not describe all nonmarket actor collaborations currently focused on local meats processing in the U.S.; a comprehensive list is beyond the scope of this paper. We also recognize that the three regional efforts we describe are located in the eastern U.S. Related work in the West is ongoing (e.g., University of California Cooperative Extension, 2013), but there are additional challenges for both local meats and supportive nonmarket actors where travel distances are greater and urban markets more dispersed, though the need for supply chain commitments remains the same. An analysis of geographic variation in this work is beyond the scope of this paper. Here, we focus on a few specific collaborations we believe have been particularly effective and can provide useful lessons for others aspiring to do similar work. In addition, we contribute analytic observations to existing theories about the role of nonmarket actors in supporting and reshaping local food systems.

Framing the Work of Nonmarket Actors in Local Food and Local Meats

As others have convincingly argued, nonmarket actors provide critical support for the expansion and evolution of local food systems by helping to navigate and remake the social, economic, and political context and conventions in which local food systems operate and facilitate the diffusion of innovation (Dunning, Creamer, Massey Lelekacs, O'Sullivan, Thraves, & Wymore, 2012; Fairfax, Dyble, Guthey, Gwin, Moore, & Sokolove, 2012; Hinrichs & Charles, 2012). Dunning and co-authors identify local food systems as an emerging institutional field and usefully describe university cooperative extension's role in developing local food systems as "institutional entrepreneurship." This concept refers to the "activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones" (Maguire, Hardy & Lawrence, 2004, p. 657). For Dunning and co-authors, cooperative extension agents, as institutional entrepreneurs, "harness resources and opportunities that exist in the relational communities in which they are embedded, catalyze collaboration across actor networks, and thus spur action that otherwise would not have occurred" (Dunning et al., 2012, p. 104).

When institutional entrepreneurs catalyze collaboration across networks, they facilitate interaction and information-sharing that can lead to the creation and use of new technical knowledge (Wolf, 2008). As Wolf notes, interaction is particularly critical for the creation of context-specific and localized knowledge. He identifies "reference networks" and "professional structures" as institutions that together drive innovation through synthesis and codification of practitioner knowledge. A professional structure is a set of organizations, formal and informal, that "coordinate[s] activity

and investment in order to advance political, economic, social, and technical interests of a class of individuals or entrepreneurs" (Wolf, 2008, p. 203); reference networks are databases that facilitate collective learning outside the boundaries of a given organization (Wolf, 2008). As a way to explain the creation and transfer of knowledge and innovation, professional structures are similar to communities of practice, groups of people who interact regularly to enhance their knowledge and expertise around a shared problem or interest within a specific domain of knowledge (Wenger, McDermott, & Snyder, 2002).

The collaborations described in this paper operate as both professional structures and communities of practice to varying degrees, backed up by a reference network. They operate on multiple levels, within their regions and nationally, to improve the landscape of meat processing and expand the local meat sector. Whether they can actually be considered institutional entrepreneurs depends on whether they are changing institutions. Providing practical guidance and technical knowledge to enhance local meat and poultry processing capacity and producer access to it is valuable and needed work; in and of itself, it does not necessarily change institutions. However, based on initial evidence of their impact, we argue that the collaborations we describe here not only serve as professional structures but also are transforming institutions, notably the working relationships between local producers and local processors and the way that their own agencies and organizations participate in building and strengthening local meat and poultry supply chains. To borrow terms from Dunning and co-authors, they are harnessing resources and opportunities in their communities, catalyzing collaboration, and spurring action that would not otherwise occur.

How Nonmarket Actors Strengthen Local Meats Processing: Case Studies

As noted, the four efforts described here focus on enhancing local meats processing as a way to enhance local meat supply chains. Three are regional, operating primarily in Vermont, North Carolina, and New York, but blurring over state lines in each case. The fourth is a national network in which all three regional collaborations also participate.

These are certainly not the first nonmarket actors to provide support for small-scale processors or local meat producers. In many states, universities have long provided technical support and education for small processors related to food safety and regulatory compliance (e.g., Flowers & Cutter, 2005), business planning (e.g., Holcomb, Flynn, & Kenkel, 2012), and daily operations (e.g., Thiboumery, 2008). Processors have technical assistance and networking opportunities through state, regional, and national trade associations. The U.S. Department of Agriculture's Food Safety and Inspection Service has a Small and Very Small Plant Outreach office, and many state meat and poultry inspection agencies provide technical assistance to plants they regulate. In a different realm, the increasing array of "how to" resources related to local foods includes those focused on local meats, from elements of USDA's Agricultural Marketing Service and the "Know Your Producer Know Your Food Compass" (USDA, n.d.) to niche livestock marketing guides written by cooperative extension for producers (e.g., Goodsell & Stanton, 2010).

The efforts we describe here are similar in several ways: they provide information and technical assistance; involve cooperative extension and public agencies, including a number of entities listed above; and learn from their peers in other regions, to share ideas, best practices, and pitfalls. But they are different in several key ways. First, while the underlying motivation is to increase opportunities for producers and consumers related to local meat and poultry, the collaborators have realized the importance of working directly with processors to solve processors' problems, rather than, for example, simply assuming that processing is "the problem" for local meat and new plants are "the solution." They are working to understand and then address the real drivers behind the perceived lack of processing. And they actively engage processors within a farm-to-plate context: their networking, technical assistance, and education efforts reach across and engage the whole supply chain, not just the practitioners (producers, processors, distributors, marketers, and so on) but

also the range of nonmarket actors who traditionally focus on one or two links of that chain (livestock extension specialists, meat scientists, business management trainers, and so on). This approach is transformative.

Vermont Meat Processing Working Group

In Vermont, keeping existing processors in business has become a priority, in large part due to the work of the state's Meat Processing Working Group. Vermont livestock producers, policymakers, and others had long been convinced that processing, constrained by regulation, was limiting local market opportunities for meat producers. Two farming and food initiatives, for the state and for New England, kicked off efforts in 2009 with meat processing as a priority.

The coordinator of the New England meat processing working group, Chelsea Bardot Lewis, decided to test these assumptions and interviewed 20 of the 28 inspected processors in New England. "After the first three, it was clear that their biggest problem wasn't regulation," she explained. "It was not having enough supply, enough animals over the course of the year." Finding, affording, and keeping a trained workforce was also a core challenge, and challenges related to both throughput and labor are compounded by seasonality (Lewis & Peters, 2011). A survey of Vermont processors conducted by the Northeast Organic Farming Association revealed similar results: the seasonality of demand for processing was a critical problem, given the need for year-round work, and storage and cut-and-wrap capacity appeared to be much tighter bottlenecks than slaughter capacity.

The research made clear that addressing inefficiencies in current processing infrastructure was likely to be more effective than trying to add plants in places that appeared to be "processing deserts." Lewis explained, "Everyone wants some graphic that shows here's where the production is, here's where the processors are, and here's a gap, so let's put a plant here. That's not the right approach. We need to move away from that top-down assessment and start from the bottom up."

The Vermont Agency of Agriculture, Food, and Markets convened a statewide meat processing task force, led by Lewis, who is now at that agency. Members are both public and private sector and include the Farm Viability Program, the Agricultural Development Program, the Agricultural Credit Corp., University of Vermont extension, the Northeast Organic Farming Association, Rural Vermont, the Castanea Foundation, and the state meat inspection program.

In 2010, the task force started "from the bottom up" in three ways: a financial assessment of the state's small processors; technical assistance for and investment in existing processors; and a series of producer-processor workshops. The financial assessment was designed to understand small processor management strategies, develop "benchmark" indicators for the sector, give processors metrics to assess financial health, and learn what long-term technical assistance would help processors become profitable, expand, or meet other goals. The assessment revealed that processors had thin operating margins, with labor and energy the primary costs; were undercapitalized and carried substantial debt; and did not track productivity or collect financial data to evaluate their businesses.

In 2011 the Vermont state legislature responded with US$50,000 in matching funds for capacity improvements. Two processors received grants: a rail system renovation to increase capacity 40 percent, and a hot-water tank and equipment for a pasteurizer. A third, a "Farm to Plate" grant, allowed the Mad River Food Hub, a new shared storage, processing, and distribution facility, to add federally inspected meat-cutting rooms to ease the cut-and-wrap bottleneck. In all three cases, task force members provided planning and technical assistance. The state's Farm Viability and Agriculture Development Programs also began offering processors one-on-one technical assistance regarding expansion planning, access to capital, and transition planning.

The workshop series addressed the need to improve producer-processor relationships, critical to enhancing business commitments, and highlighted processor expertise. At the first session, a processor taught carcass assessment and grading, yield tracking, and how to achieve consistent carcass quality throughout the year. The second session covered regulations and third-party certifications related to animal welfare and humane

handling, both on-farm and at the processor. At the other two sessions, producers and processors shared marketing strategies.

To address the problem of highly seasonal demand, the task force began working with producers on collaborative marketing arrangements to scale up production and spread it over the year. To increase the labor pool, a meat-cutter training program is being planned in partnership with technical education centers, the state labor department, and the state economic development agency. As another way to enhance processor viability, a "Know Your Processor" marketing campaign will use market research on consumer valuation of meat processing in the value chain to raise the profile of the state's processors and help them market their added value (e.g., humane handling and cutting quality and consistency).

The task force is also creating and nurturing professional networks to facilitate peer learning across the state and region. First, they helped rebuild the state's nearly defunct Meat and Poultry Processors Association and in 2012 took the association's leadership to a national meat-processing convention to meet leaders from other state and regional trade associations. Second, in partnership with colleagues, producers, processors, and other regional stakeholders, they hosted the first New England Meat Conference in 2013, which drew 300 attendees from farming, processing, retail, restaurants, distribution, public agencies, and nonprofits. While processing and processors were the central theme of the conference, the title explicitly recognizes the farm-to-plate approach. An extension specialist participant noted the "cross-fertilization between people representing different sectors of the meat industry. Producers were sitting with processors and butchers and distributors — all were asking great questions, and all were honestly listening to one another and learning from each other's expertise" (Zipparo, 2013).

At this writing, the task force is planning to recruit and facilitate management teams of experienced processors and targeted consultants to provide guidance and mentoring for two processing start-ups. Task force leaders are using the national network (described below) to plan and implement this project, seeking insights from peer efforts in other regions.

The local meat sector in Vermont appears to have expanded significantly since 2010, when the task force began its work. Randy Quenneville, meat programs section chief with the Vermont Meat Inspection Service and a member of the meat processing task force, reported rapid expansion of processing capacity in the state: the number of state-inspected plants has grown to 16, from three in 2005; several state-inspected plants are transitioning to USDA-inspected status in order to allow interstate shipment; the innovative Mad River Food Hub, a commercial kitchen, is now USDA-inspected to do value-added meat processing; producers are committing to slaughter dates into the coming year, to provide inspected plants with consistent throughput; and three custom-exempt[1] processors have upgraded to state inspection within the last year (R. Quenneville, personal communication, Aug. 7, 2013). While consumer demand and producer interest are likely the primary drivers, the work of the task force has provided the needed support for the processing capacity that links the two together.

North Carolina: NC Choices

In North Carolina, efforts to bring more local meat to market have generated new support for the state's small processors. NC Choices, an initiative of the Center for Environmental Farming Systems (CEFS), is leading this work, and its two staff collaborate with agency and nonprofit partners around the state. CEFS, established in 1994 by North Carolina State University, North Carolina Agricultural and Technical State University, and the North Carolina Department of Agriculture and Consumer Services, provides agricultural research, extension, and education (CEFS, n.d.). CEFS launched NC Choices in 2005 with support from the Kellogg Foundation and initially focused on developing market opportunities for pasture-based pork producers through an online directory, meat-

[1] Custom-exempt processors are not continuously inspected by USDA or an "equal to USDA" state inspection program; the meat cannot be sold and is for the use of the owner of the animal. For more about meat processing regulations, see Johnson, Marti, & Gwin, 2012.

buying clubs, and wholesale marketing guidance. This work, coupled with what they were hearing from statewide local food system meetings, suggested a need for more meat processing and value-added processing in particular. Producers wanted to sell sausage, bacon, and cured meats, but of the state's 20 small-scale processors, including custom-exempt, USDA-inspected, and state-inspected plants, only a few offered value-added processing and the quality cutting, packaging, and labeling services producers needed to expand beyond very basic direct sales. "We found ourselves asking," said Jennifer Curtis, then NC Choices director, "how can we help on processing?"

Three sequential projects involving processing, distribution, and retail led NC Choices to its strategic decision to focus attention and resources on education and technical assistance for existing processors. First, Curtis convinced the owners of a small, USDA-inspected, value-added processor, Acre Station Meat Farm (ASMF), that their plant had the capacity for and could financially benefit from offering fee-for-service processing in addition to handling their own product. This gave many NC producers their first access to inspected value-added processing. NC Choices brought one of ASMF's owners to the state's largest sustainable agriculture conference in 2008, paying his way and introducing him to more producers and meat buyers who needed his services; he was the first small processor ever to attend that conference. NC Choices also helped ASMF write grants for new equipment and business development. ASMF now processes for 80 different producers; has brought on Whole Foods as a major customer; has grown from 10 employees to more than 25; and has steadier income than when it relied on seasonally variable retail sales. The plant is located on the coast, up to 3 hours' drive for many producers in the state, but its customer base is growing; some producers collaborate on livestock transport and product delivery to urban markets in the middle of the state. NC Choices' experience with AMSF laid the groundwork for future technical assistance for existing processors and facilitation of producer-processor relationships.

The second project focused on the needs of buyers to help them pull more product through the supply chain. From 2008 to 2010, NC Choices partnered with Weaver Street Market (WSM), the state's largest natural foods cooperative, on a pilot project to expand wholesale market opportunities for local meats. NC Choices recruited producers and WSM committed to purchasing whole animals, which it receives from a small, local processor as quarter carcasses; WSM butchers cut and wrap the meat for the co-op's three retail stores. The project increased WSM's weekly sales of local grass-fed beef and pastured pork 150 percent (North Carolina State University [NCSU], n.d.). Yet expanding this model to other wholesale buyers was difficult because most restaurants, food service, and retail grocers lack the equipment and expertise to buy whole carcasses from producers and coordinate with processors.

The third project addressed this gap. In 2010, with start-up funding from the Kellogg Foundation, NC Choices created and then spun off a for-profit business to aggregate, distribute, and market local, pasture-raised meats. The company, now Firsthand Foods, works with two small USDA-inspected processors and markets and provides weekly distribution of fresh and value-added pasture-raised meats, sourced from more than 40 North Carolina producers, to 60 customers including restaurants, specialty retailers, natural grocers, mobile markets and food trucks, and institutional food service providers (CEFS, 2013). It has three employees and had an estimated US$1 million in sales in 2013.

Based on these experiences across the local meat supply chain, NC Choices made two strategic decisions. The first was to create a formal venue for farm-to-plate learning and networking, with particular focus on processing. NC Choices hosted the first Carolina Meat Conference in 2011, for producers, processors, marketers, consumers, regulators, and others involved with local meat supply chains. Sessions covered production, producer-processor collaboration, marketing, meat cutting, animal handling, and on-farm poultry slaughter. More than 300 people from 13 states attended. Local processors, who had been "holding their cards pretty close to the chest, not ready to invest," in local meat, left the conference with new awareness about the potential market opportunity,

according to NC Choices staff. In 2012, NC Choices created the Carolina Meat Institute (CMI) to offer workshops by national experts on growing a meat business, carcass breakdown, charcuterie, and related topics. To date, more than 700 participants from 16 states have attended CMI workshops.

The second strategic decision was to focus more time and resources on education and technical assistance for processors. As in Vermont, an important insight was that expanding local meats required understanding the actual capacity and constraints of existing processors who could potentially process for local producers but were not yet set up to do so. Curtis explained, "Everyone says we don't have enough. But we're not really clear what we *do* have and how much more we really need. How can we optimize existing processors and meet *their* needs?" The more they talked to small, local processors, the more they learned about the barriers to expansion: a lack of year-round commitment from producers; limited business development support, capital assets, and employee training opportunities; and high staff turnover. Processors were also reluctant to invest in expansion or new services for local producers without assurances that local meat was more than a passing trend (NC Choices, 2012). Casey McKissick, current program director, explained, "We kept getting calls about business plans for new processing plants. But we kept saying, what about the processors who are already in business? What can we do for them?"

NC Choices designed a technical assistance program that would target processors' specific needs and started with a small, custom-exempt plant. The co-owners were experienced butchers who had worked with producers and freezer-meat customers for many years. Yet their custom-exempt status meant the meat could not be sold. "They weren't aware of the industry's growth and consumer demand for local and niche meats or how to capture more of the processing business for producers who direct market," McKissick explains. "The Carolina Meat Conference lit a fire under them" (NMPAN, 2012, para. 3). In 2012, with NC Choices' help, the butchers made progress quickly: they bought a computer and learned Excel, word processing, and email; applied for a USDA grant of inspection; wrote a customer manual; applied for cost-share grants for value-added equipment and a new facility for handling live animals; and hosted an open house for new customers, which drew 70 people from seven counties.

Based on this experience, NC Choices applied for and received a grant from the North Carolina Rural Center to launch, in early 2013, a Meat Processors Business Development Assistance Program to offer similar hands-on assistance to other small processors with a focus on business development and technical training.[2] Processors applied to be part of the program, and projects were selected based on their potential to enhance the state's local meat-processing capacity. The first round of projects, underway as of this writing, include improving operational flow and efficiency, design of cloud-based Hazard Analysis Critical Control Point (HACCP) management systems, accounting training, cutting tests, staff training for value-added product expansion, and figuring out whether a local grocery-store butcher counter could cost-effectively offer state-inspected cut and wrap services to producers. Project results will be reported in 2014, along with a best practices manual written for both processors and other current or potential technical assistance providers; this second audience reflects NC Choices' commitment to help peer organizations learn from its experiences with this complex, challenging project.

While the efforts described above have been led by NC Choices, they are in fact the product of multiple partnerships with public and private agencies, organizations, and businesses. Reflecting the partnership structure of its parent, CEFS, NC Choices is deliberately not an independent actor but the active center of statewide collaboration. For example, an important and ongoing partner is the North Carolina Department of Agriculture's Meat and Poultry Inspection Division (MPID). MPID has worked with NC Choices to reduce regulatory confusion for producers and processors related to processing and marketing of local meat; survey the state's processors about the range of services they offer producers (North Carolina

[2] Disclosure: Author Gwin is a consultant on this project.

Department of Agriculture and Consumer Services [NCDACS], 2011); and even create supportive policy: NC Choices collaborated with MPID to change the annual limit for on-farm poultry slaughter from 1,000 to 20,000 birds and then educate producers about the new rules and market opportunities.

New York: Northeast Livestock Processing Service Company

In New York State, an independent, for-profit service company has provided important leadership to strengthen local meats processing, both statewide and in the broader Northeast region. What began as an innovative approach to improving producer-processor relationships and access to processing has evolved into a marketing and distribution company that continues to support both producers and processors. As described below, this work complements university cooperative extension programming that helps producers with niche meat production and marketing, including navigating processing regulations.

The Northeast Livestock Processing Service Company (NELPSC) was conceived in 1999 as a way to bridge the gap between producers and processors. Producers who sold sides and quarters were increasingly having trouble getting their animals processed; the need grew as the local food movement and by-the-cut sales of local meats escalated in New York. Keith DeHaan, a livestock processing consultant funded by the Rockefeller Foundation to do a feasibility study for new processing capacity in the state, realized that capacity itself was less the limiting factor than the ability of local producers to establish and maintain working relationships with existing processors. He proposed a fee-for-service company that would help member producers identify processors, schedule processing dates, give clear cutting instructions, and develop good working relationships for the long term. NELPSC was officially established in 2005 by the Hudson-Mohawk Resource Conservation and Development Council, with a US$52,000 grant from the New York Department of Agriculture and Markets (Munger, 2008). It is a limited liability corporation (LLC) with an all-producer board of directors and one full-time paid employee, Processing and Marketing Coordinator Kathleen Harris.

The company's original mission was what Harris calls "processing facilitation." For a one-time fee of US$50, NELPSC matches producers with processors that meet their needs (location, pricing, services provided); schedules slaughter dates; and conveys cutting instructions. For an additional fee, because of the time required, Harris provides quality-control oversight in the plant when a producer's livestock are being processed. The approach is effective in developing strong producer-processor relationships: after the first few years, most producers are able to work directly with their processors without NELPSC's assistance. In 2012, NELPSC had more than 130 producer clients and working agreements with 11 processors, both USDA-inspected and state-licensed, custom-exempt.

Harris then turned her attention to a different set of producers asking for help: those who wanted to sell into local, niche markets but did not want to do the marketing themselves. In a move similar to NC Choices' launch of Firsthand Foods, in 2008 NELPSC started Local Foods from Local Farms, a marketing and distribution company that aggregates product from multiple producers and sells to wholesale buyers, primarily privates schools and universities. Harris finds buyers, takes orders, and puts a call out to her producer members to select livestock, mostly grass-fed beef culls, to fill those orders. She arranges for slaughter and processing at one of the federally inspected, third-party audited plants NELPSC works with regularly and delivers orders in the NELPSC refrigerated truck. Producers pay a fee, based on hanging weight, to cover the cost of these services. Harris sells only wholesale, to avoid competing with producer members. She notes, "We sell where they can't sell for themselves."

Until 2010, NELPSC subsidized its processing facilitation services with grants from the NY Farm Viability Institute and private foundations. In 2010, revenue from Local Foods from Local Farms allowed NELPSC to become financially self-sustaining. Taking on marketing and distribution allowed NELPSC not only to help producers access new markets but also to become a key

customer for its member processors, providing steady throughput in higher volumes than individual producers can typically deliver.

As a for-profit company, NELPSC is directly responsible to its members, but its work has strengthened the local meats processing landscape across the state and region. From a farm-to-plate perspective, the processing facilitation in particular complements the work of another key nonmarket actor in the region, Cornell University Cooperative Extension, on sustainable livestock production and local meats marketing. Cornell publishes a guide to niche meat marketing that includes processing regulations, moderates a regional email list on local meat production and processing, and works directly with the state agriculture agency and the USDA Food Safety and Inspection Service to clarify regulatory questions for producers and small processors. To facilitate sales of farm-direct freezer meat, the university developed an online marketing platform, MeatSuite, and is building two freezer unit facilities that will function as old-style meat lockers that consumers can rent to store meat they purchase in bulk from local producers (LeRoux, 2013).

All of this work together has helped underwrite a significant expansion of processing capacity for local meats in the region over the last decade. New USDA-inspected plants have been built, custom-exempt plants have transitioned to inspection, and producers have built their own retail-exempt, state-licensed cut and wrap plants (Harris, 2013). None of it would have happened without entrepreneurial producers and processors, and consumer to buy the product, but NELPSC, Cornell, and other agencies and organizations have provided essential support.

National Networking for Shared Learning and Innovation

The three regional collaborations discussed so far are rooted in local context and conditions. They also benefit from connecting, on a national basis, with other individuals and entities, public and private sector, with expertise and experience related to local meats processing. The Niche Meat Processor Assistance Network (NMPAN) was created in 2007 to facilitate such connections. NMPAN began as primarily an online information hub, both collecting and generating relevant resources, but has evolved into an active peer-learning community that fosters and diffuses innovation. In Wolf's terms, NMPAN combines a reference network with a professional structure that links institutional entrepreneurs with processors, producers, and other businesses in local meat supply chains. Interactions occur largely by phone, an email list, webinars, and occasional in-person meetings. The network includes university faculty, primarily cooperative extension; federal, state, and local agencies; nongovernmental organizations ranging from meat processor trade associations to sustainable agriculture advocacy groups; and producers, meat and poultry processors, marketers, and buyers. NMPAN's advisory board, which meets monthly by phone, is drawn from industry, academia, nonprofit organizations, and government, including the USDA Food Safety and Inspection Service (FSIS) Small Plant Outreach Office. The two authors of this paper created and coordinate NMPAN.

In its first phase, from 2007 to 2011, NMPAN focused on collecting and creating practical resources related to local meats processing (e.g., processor case studies, business planning and management tools, simple guides to regulatory requirements, mobile slaughter unit videos and guidebook), made available online; start-up funding (US$300,000 over five years) was provided by the Kellogg Foundation, Heifer International, USDA Rural Development, and the eXtension Imitative. With this reference network of resources now largely in place, two distinct but linked sites of shared learning and innovation have emerged. The first is the NMPAN email list, where processors and producers ask and answer technical questions related to many aspects of plant operations, from plant design, wastewater systems, and equipment selection, to food safety, HACCP, and third-party audits and to product and cutting quality. Online interactions may continue by phone, with one processor advising another about refrigeration or setting up an apprenticeship program. In 2013, NMPAN coordinators began to facilitate this deeper interaction more actively by creating an informal peer-consulting network for processors

who would prefer to learn from their peers — "another guy with his name on the front door" (although they are not always guys) — than from professional consultants or suppliers.

Shared learning and innovation diffusion also occurs among nonmarket actors in the network, most actively during monthly advisory board phone calls; the NMPAN Advisory Board includes representatives from all three regions discussed above. Advisors bring their specific projects and ideas to the calls for group brainstorming and suggestions. The different regions are, in a sense, a laboratory to test ideas and approaches. Advisors attend and speak at each other's conferences, often bringing processors from their regions; the New England Meat Conference was inspired by and modeled after the Carolina Meat Conference. In parallel with the peer-consulting network, the advisory board is now strategizing how to create "management teams" — small groups of experienced small processors, consultants, and potentially producers, perhaps recruited from each other's regions — that would provide first start-up support and then long-term mentoring for motivated but inexperienced new plant operators.

The group is also a valuable sounding board for frustrations and a source of guidance when projects unravel, partners pull out, and plans shift in unexpected ways. For example, a processor who could potentially provide valuable processing to local producers may ask for technical assistance to do so but then be unwilling to make any recommended changes: the priorities of a specific business may not match broader food system goals. Advisory board members help each other decide if, when, and how to end or overhaul projects.

The two professional structures are overlapping and have fluid boundaries. Interactions with practitioners, from email list discussions to meet-ups and plant tours at processing conventions, are highly instructive for advisory board members and other similar nonmarket actors in the network, in order to learn about the technical, regulatory, and business environments in which these processors operate. Advisors and other assistance providers have recruited NMPAN member processors as expert consultants. New knowledge and resources generated by advisory board members — together or in their home regions — can be circulated to the broader NMPAN network, including initiatives described above. The more tacit this knowledge is, the harder it is to disseminate without practical interaction, and regions with supportive nonmarket actors who can make knowledge from elsewhere relevant to local conditions appear more likely to benefit.

Conclusion

The efforts we have described appear to have had a significant and positive impact on local meat processors and local meat supply chains. They involve different types of public agencies, both regulatory and development-focused; different types of nonprofits, from trade associations to advocacy groups; universities, primarily cooperative extension; and even, as in New York, for-profit entities. They use a variety of approaches: technical training and assistance, regulatory clarification and education, targeted investment, peer learning and communication, and other mechanisms to support not only individual businesses but also the commitments between them.

These efforts, we suggest, are vibrant examples of institutional entrepreneurship: they harness resources, catalyze collaboration, and spur action that otherwise would not have happened. They are also transformative, helping shift not only how producers and processors work together, but also how their own agencies and organizations engage with local meats as a subset of local food. Their processing-related work is done explicitly within a farm-to-plate context, nested within work that spans local meat supply chains and demands cooperation and interaction along the entire chain. These institutional entrepreneurs are working to analyze and then address the perceived lack of processing from the processor's perspective, rather than accepting the conventional notion that simply building more processing plants will grow the local meat sector. They foster innovation by cooperating with each other, as working groups or loose collaborations, not only in their regions but nationally: they learn from and co-create new knowledge and strategies with their peers in different regions. They share successes and failures, big ideas and rabbit holes. Their ability to connect and collaborate with

their peers in other regions strengthens their ability to support transformative learning in their home regions. As other farm-to-plate approaches to increase the extent of local meats emerge elsewhere in the country (e.g., Barry & Pirog, 2013), they are using NMPAN to connect with peers, trade ideas, and learn from each other's experiences.

Enhanced commitments between processors and their producer-customers are still fundamental to the persistence and expansion of local meats. No amount of institutional entrepreneurship can fill the gap if processors do not have enough livestock to process enough of the year to cover both their operating and fixed costs and earn at least some profit. As demonstrated in this paper, however, nonmarket actors, as institutional entrepreneurs, can help both producers and processors change how they have traditionally worked together and move toward more committed relationships, from improved communication to aggregation, distribution, and marketing. Government agencies, universities, nonprofit organizations, and others can support the local meat sector through research, technical and regulatory assistance, investment, and facilitating connections and peer-to-peer learning focused on local meats processing.

Recommendations for Practitioners: Agencies, Nonprofits, Universities, and Other Nonmarket Actors

The institutional entrepreneurs described here and the approaches they are taking provide, to some degree, recommendations for what can be done and how to do it. Targeted technical assistance and training on a range of topics, from food-safety regulatory compliance to order and inventory management, can build capacity for both processors and their producer-customers. Needs and opportunities, and therefore the strategies and tools to address them effectively, will vary from region to region. Yet a few recommendations that follow are applicable across regions.

Above all, when local meats processing emerges as an issue of concern, it is critical that existing processors are not only informed but also actively consulted about their own concerns, constraints, ideas, and opportunities. This often requires not only inviting them to the table (bringing processors to producer meetings) but going to their table (bringing producers to processor trade association meetings). Educational events should be designed and delivered to encourage shared learning among producers and processors. Not all processors will wish to participate, and others may start and then change their minds, but proposed innovations in local meats processing must have buy-in from at least some local meat processors to work.

Second, a wide range of technical assistance and capacity-building can help strengthen local meats processing, related to business and management skills, grant-writing, transitioning to USDA inspection or third-party certification, operational flow and efficiency, regulatory compliance, customer service, and other topics. Institutional entrepreneurs can also bring innovative and successful systems from other regions and businesses. For example, scheduling is a common challenge for both producers and processors: producers may have to book slaughter spots long in advance, yet processors often have costly no-shows that leave employees and equipment idle. Institutional entrepreneurs can help producers and processors adapt and implement innovative, proven scheduling systems (as discussed in Gwin et al., 2013). Because a new approach to scheduling is likely to require additional commitment on both sides, primarily time and mental energy, institutional entrepreneurs can provide critical support and encouragement in the early months as the new approach gains traction and proves its value.

Third, while efforts to change federal meat and poultry inspection law and policy to favor small, local processors have gained little traction (Gwin & Thiboumery, 2013), other policy strategies have been effective and are replicable. Examples include clarifying and adjusting state- and county-level administrative regulations (e.g., interpretations of federal poultry processing exemptions and U. S. Food and Drug Administration (FDA) Food Code variance requirements for cured meats); establishing tax incentives or loan guarantees for plant and equipment upgrades; and working with state and local agencies to allow innovative wastewater and offal management systems proven to work else-

where (e.g., Bonhotal & McGarva, 2009; Chivers & Gunthorp, 2013). As demonstrated in Vermont, state agencies can offer valuable support by allocating staff time to work on these issues, to provide not only technical assistance to individual plants but statewide leadership on industry-scale challenges and solutions.

Suggestions for Future Research

Applied research is needed on a wide range of topics, which many nonmarket actors and cooperative extension faculty in particular may be well positioned to address. Research targeting specific aspects of small processing businesses could help enhance capacity and profitability:

- *Scale-appropriate food safety strategies:* While all plants, regardless of size, must ensure that meat and poultry are produced safely, effective interventions can be designed that work well in a small plant environment (e.g., Flowers & Cutter, 2005). Recently stepped-up emphasis by federal regulators on validation of interventions within the HACCP system makes this need even more pressing: small plants need access to more "safe harbor" process guidance (e.g., USDA, 1999a; 1999b).

- *Increasing operational efficiency:* Constraints analysis has proven effective in helping small processors ease bottlenecks without the considerable investment required to add floor space or build a bigger facility (e.g., McCann, 2011). Additional research that proves the value of this approach in a small plant environment should be paired with an educational and outreach strategy targeting small plants.

- *Byproducts:* For large, conventional processors, "the drop" (heads, hides, hooves, bones, fat, blood, and offal) is their primary source of revenue, often more so than meat; they can collect and refine byproducts at large enough volumes to access valuable international markets. For small processors, the drop is typically a liability, not a revenue stream. A few small processors have experimented with on-site composting, bioenergy generation, and small-scale incineration. Yet to be explored is the possibility of processor collaboration on a regional scale for shared byproduct collection, refinement, and marketing.

All of these are practical topics that rest on the assumption that strengthening processing infrastructure for local meats is a good idea. Yet a broader question about what we are seeing in local meats processing also demands attention. While energy and enthusiasm for local meats and local meats processing are high now (at least in some areas), what of the long run? A limitation of our research is that it describes initiatives occurring over a relatively short period of time and provides only short-term, though positive, evidence of their value. How is the processing landscape evolving (or not) to meet the needs of local meat producers and marketers, not only now but in the future? Are these changes increasing the availability of local meats and the profitability of producers and their supply chain partners? Will current interest in local meats — in its 21st century version, far beyond "locker" or "freezer" meat sales — not only persist but grow enough to support new infrastructure investments? Anecdotal evidence suggests that in many parts of the country, new small processors are opening or being planned, and existing processors are making changes, all in response to apparent demand for local meat processing services. As small businesses in a high-cost, thin-margin industry, they face tough odds. Significant, stable commitments from producers, both livestock and financial investment, will be critical to their long-term survival. Longitudinal research to track the trajectory and evolution of these businesses, both as a sector and through in-depth case studies, would yield important insights about how to design and maintain resilient infrastructure for local foods.

Acknowledgements

The Economic Research Service of the U.S. Department of Agriculture provided partial funding support for this research. The authors wish to thank the five advisors

and two research assistants involved with the project; the many people we interviewed and worked with over the course of the project; the Niche Meat Processor Assistance Network Advisory Board; and the five anonymous JAFSCD reviewers who provided helpful suggestions and insightful comments on the manuscript.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Premium potential for geographically labeled, differentiated meat products

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Submitted September 6, 2013 / Revised November 26, 2013, and January 13, 2014 / Accepted January 14, 2014 / Published online March 19, 2014

Citation: Curtis, K. (2014). Premium potential for geographically labeled, differentiated meat products. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 97–111.
http://dx.doi.org/10.5304/jafscd.2014.042.016

Abstract

Growing consumer demand for local foods and products grown under specialty production systems provides livestock producers with the opportunity to increase profits and reduce variability through production of high-value finished meat products, integration of additional species, and targeted marketing efforts. This study examines consumer preferences and willingness to purchase and pay premiums for origin-labeled differentiated beef, pork, and lamb products through a mail survey of Nevada residents. Logit model results show important differences in consumer preferences across meat products. Pricing premiums for differentiated pork and lamb products ranged from 11 to 15 percent, while those for beef products ranged from 22 to 40 percent. Additionally, premiums were higher for superior meat cuts. Product appearance attributes such as marbling, texture, and brand had a significant impact on consumer willingness to pay for all products, while product credence attributes, such as production method and origin, only had a significant impact on consumer willingness to pay for commonly known beef products. Target consumers for local differentiated pork and lamb products include higher-income, white married adults with children. Target consumers for beef products include higher-income, younger white adults. Study results show the importance of targeted consumer marketing for less commonly consumed products, such as lamb. Including information on the health benefits of specialized production methods in marketing materials would also be useful, especially if targeting seniors and ethnic groups.

Keywords

cheap talk, consumer willingness to pay (WTP), differentiated meats, natural, origin labeling, state-sponsored designations (SSDs)

Introduction

Significant price volatility and economic losses in the livestock industry combined with increased consumer demand for differentiated meat products have led producers to consider alternative management strategies (see figure 1). These strategies include shifting from traditional cow-calf opera-

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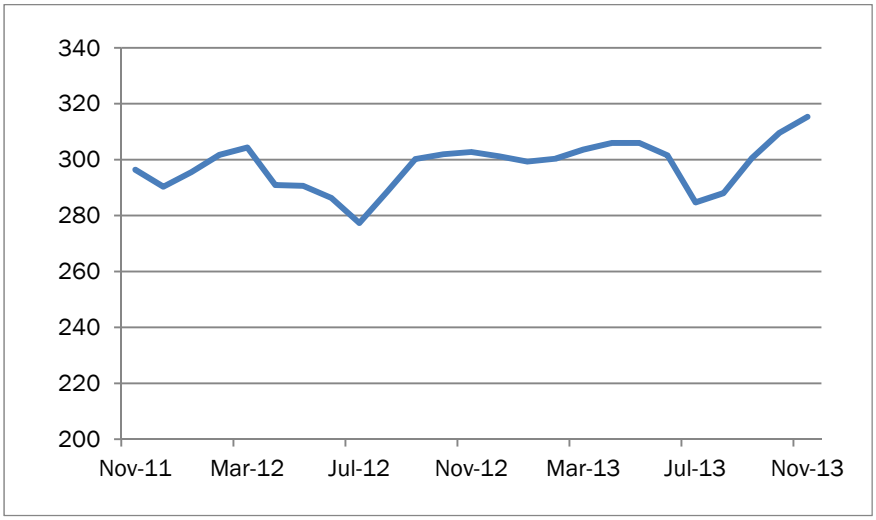
tions to production and direct sales of differentiated, high-value finished meat products and the incorporation of additional species into current livestock operations. The feasibility of such strategies has been enhanced by increased consumer interest and willingness to pay (WTP) premiums for meat products labeled with credence[1] attribute information, such as origin and special production techniques. The prevalence of branding and labeling programs based on the geographic area of production (such as region, state, or country), and on production techniques (such as organic, natural, and grass-fed) has simplified access to markets and adoption of alternative management strategies among livestock producers.

Figure 1. Choice Beef Gross Farm Value (Cents/Lb.), Monthly for November 2011 to November 2013



Source: U.S. Department of Agriculture Economic Research Service. (2013, December). *Choice beef values and spreads and the all-fresh retail value* [Data file]. Retrieved from http://www.ers.usda.gov/data-products/meat-price-spreads.aspx

Although differentiated products may capture premiums, they also present additional production costs, as well as slaughter, processing, and marketing issues for livestock producers (Acevedo, Lawrence, & Smith, 2006). Origin labels ease consumer concerns regarding food safety and the environmental impacts of food production and transportation, and also appeal to the increasing consumer demand for locally produced foods (Burnett, Kuethe, & Price, 2011; Curtis & Cowee, 2011; Curtis, Cowee, Velcherean & Gatzke, 2010). Additionally, forage-based livestock feeding programs have been shown to have many health benefits for consumers (Duckett, Wagner, Yates, Dolezal, & May, 1993) as well as environmental and resource sustainability benefits to society. For example, Pimentel, Oltenacu, Nesheim, Krummel, Allen, and Chick (1980) found that grass feeding reduces livestock production energy needs by 60 percent and land resources by 8 percent. Hence the combination of local origin and natural grass-fed production methods may provide price premiums sufficient to cover the additional production and marketing costs observed by livestock producers.

The purpose of this study is to evaluate market and pricing potential for *multiple* state origin-labeled differentiated meat products through a mail survey of Nevada residents. We seek to determine the effect of consumer sociodemographics, meat purchasing habits, meat attributes, and cheap talk and auction scripts[2] on consumer willingness to purchase local differentiated meat products and their willingness to pay (WTP) premiums for such products. The data were collected through a mail survey of 542 households across the state of Nevada. Logit models were used to examine consumer willingness to purchase and pay for *NevadaGrown* grass-fed beef and lamb, and natural pork products. While the results are specific to the western United States, the conclusions are likely of interest to livestock producers and meat marketers

[1] Credence attributes are those that cannot be ascertained though product visual inspection or consumption.

[2] Cheap talk and auction scripts are used to correct for consumer bias in stated preference surveys. Survey respondents are provided information on the meaning and underpinnings of hypothetical bias and asked to consider their true willingness to pay and budget in their decision. The auction script describes how the auction process encourages consumers to bid their true willingness to pay.

generally, especially those looking to understand the market potential for less commonly consumed, differentiated local pork and lamb products.

Previous Literature

A significant amount of interest in food products labeled for geographic location of production has emerged in the literature. Differentiating food products by geographic area of production is especially important in Europe, where the European Union (EU) has granted legal protection to these products through the EU Protected Geographical Indication (PGI). Research shows that PGIs are recognized by consumers and are capable of adding value to food products (McCluskey & Loureiro, 2003; Resano, Sanjuan, & Albisu, 2009). The reputation and promotion of PGIs are built principally on consumers' perceived quality of these products.

In the United Sates we see a proliferation in geographic labeling programs in the form of state-sponsored designations, or SSDs. SSDs have been common since the 1980s, but the "buy-local" movement has increased interest in the use of SSDs to address consumer interested in purchasing "local" food items. As a consequence, state-based promotional programs have seen a rapid proliferation since 2001 (Onken & Bernard, 2010). The effectiveness of state labeling programs in increasing consumer WTP for food products is noted in several studies. Examples include a study by Nganje, Hughner, and Lee (2011), who examined *Arizona Grown* carrots and spinach, and a study by Bailey, Bosworth, and Curtis (2012) examining *Utah's Own* labeled ice cream products.

In recent years, numerous studies have sought to determine consumer WTP for beef products with origin and production protocol labels, such as steak and ground beef. Examples examining the impact of geographic regions of production and/or origin include a study by Umberger, Fuez, Calkins, and Sitz (2003) which estimated consumer WTP by country of origin labeling (COOL) for steak and hamburger, as well as for steak with a guarantee of U.S. production, and steak with both the U.S. guarantee and a regional label. Consumers were willing to pay premiums of 11 to 24 percent depending on the cut of meat and label, and respondents who were presented with the regional label were 15 percent more likely to pay a premium for the guaranteed U.S. product. Louriero and Umberger (2003) found that respondents were willing to pay premiums of 38 percent and 58 percent for steak and hamburger with a "Certified U.S." label. Loureiro and Umberger (2005) estimated consumer premiums of 2.9 percent, 2.5 percent, and 2.5 percent for U.S.-certified ribeye steak, chicken breasts, and pork chops, respectively.

Umberger, Feuz, Calkins, and Killinger-Mann (2002) used an experimental auction to assess consumer WTP for domestic corn-fed beef and Argentine grass-fed beef based on product flavor characteristics. While 23 percent of respondents were willing to pay a premium for the grass-fed beef, 62 percent were willing to pay a premium for the corn-fed beef (the remaining 15 percent were indifferent between the two). The authors contend that there are two specific consumer groups, one preferring grain-fed and the other grass-fed, and that each is willing to pay a significant premium for their preference. Feuz, Umberger, Calkins, and Sitz (2004) came to a similar conclusion in their estimation of consumer WTP for quality attributes of beef steak, including flavor and country of origin. They found that respondents were able to taste a difference in flavor between domestic corn-fed beef, Australian grass-fed, and Canadian barley-fed beef even in a blind taste test.

Mennecke, Townsend, Hayes, and Lonergan (2007) used conjoint analysis to determine the features of an "ideal" steak. They found that region of origin was the dominant characteristic in the steak-purchasing decision, while feed type was less important. In general, respondents preferred the grain-fed over the grass-fed steak. Abidoye, Bulut, Lawrence, Mennecke, and Townsend (2011) found that the characteristics of traceability, grass-fed, and U.S. origin were highly valued by U.S. consumers, who were willing to pay an average price premium of about 34 percent for grass-fed assurance in beef steak. Evans, D'Souza, Collins, Brown, and Sperow (2011) found that through the use of experimental auction techniques, consumers in Pennsylvania and West Virginia were more likely to prefer grass-fed Appalachian beef over grain-fed

samples due largely to nutritional content and other observed product attributes.

Additional literature examines consumer preferences and willingness to pay premiums for grass-fed beef products as a result of consumer health perceptions. A study by Lusk and Parker (2009) found that consumers preferred grass-fed beef over supplementing a primarily grain diet to improve Omega 6:3 ratios, and a study by Umberger, Boxall, and Lacy (2009) showed that health-related messages and nutritional-content labeling were important drivers of U.S. consumer WTP for grass-finished beef. Xue, Mainville, You, and Nayga (2010) and Chang, Xu, Warmann, Lone, Munzimi, and Opoku (2013) found that in addition to consumer beef consumption rates, experience with food-related diseases and nutrient and health knowledge significantly impact consumer WTP for local and grass-fed beef.

Lusk, Fields, and Prevatt (2008) estimated consumer WTP for beef products (ribeye steak and ground beef) that varied by feed type, antibiotic use, traceability, package size, and price; they found that although consumers preferred pasture-fed beef to a product with no feed information and traceability, consumers were more concerned with antibiotic use than either feed type or traceability. McCluskey, Wahl, Li, and Wandschneider (2005) estimated consumer WTP for grass-fed beef from a health benefits standpoint. Results of a choice-based conjoint analysis showed that consumers were willing to pay a premium of US$5.65 per pound for a low-fat, low-calorie beef steak (the grass-fed steak) relative to a high-fat, high-calorie steak (the conventional steak), and that a steak containing high levels of omega-3s could earn a premium of US$3.42 per pound over a standard steak. However, the authors state that these premiums may be high as nearly half the respondents were surveyed in a natural foods store. This is confirmed by Conner and Oppenheim (2008), who found that consumer WTP for pasture-raised beef and milk was higher among natural food store customers than traditional grocery store customers.

Few studies examine consumer preferences for alternative production protocols for non-beef products such as lamb, pork, or poultry. One example includes a study by Grannis and Thilmany (2000) based on a 1998 mail survey of U.S. residents concerning consumer WTP for natural meats, including natural pork products. Results show that 29.7 percent were willing to pay a 10 percent price premium for natural pork chops and 6.25 percent were willing to pay a 20 percent price premium. At a 10 percent premium, 40 percent were willing to buy natural ham, and at a 20 percent price premium, 14.2 percent were willing to buy natural ham.

This study builds on past findings by incorporating a production protocol with a state designated origin label (*NevadaGrown*) in a non-separable manner in order to examine consumer WTP for *multiple* differentiated meat products (by type and cut), including beef, lamb, and pork. Additionally, consumer demographics, preferences for meat attributes, and meat purchase outlet are examined for their potential impact on consumer WTP and purchase local differentiated meat products.

Data and Methods

The data were collected though a mail survey (2007–2008) sent to a random sampling of 5,200 households across Nevada, with 542 surveys returned and considered viable for a response rate of 10.4 percent. A modified Dillman (2000) approach was used to conduct the survey, in that the initial survey mailing was followed by reminder postcards mailed in the second and fourth weeks afterward. A cover letter accompanying the survey discussed the research objectives as well as the potential benefits to consumers and livestock producers. The survey sample demographics were representative of the state of Nevada (U.S. Census Bureau, n.d.), with median annual income of US$45,000 to US$60,000, median age of 46 to 55 years, 56 percent female, and a median education attainment level of "some college." Approximately one-third had children in the household (31 percent), 63 percent were married, and 81 percent identified themselves as White (higher than the Nevada population at 66 percent). The respondents were largely from southern Nevada (58 percent). A large portion of the households were small, with 63 percent reporting 1–2 members and 27 percent reporting 3–4 members. About two-

thirds of the sample was employed full-time (59 percent), while 25 percent were retired.

The respondents were asked to rate 18 separate meat attributes in terms of importance in their meat purchasing decisions on a rating scale of one to five, where one indicated the attribute was *not important* and five indicated the attribute was *extremely important*. Meat freshness, taste/flavor, safety, and tenderness were assigned the highest average ratings over the sample (see table 1). Animal feed type (such as grain or grass-fed) and product origin were ranked in the bottom third, with brand name ranked as the least important attribute. To assess the effect of meat purchasing outlets on preferences and WTP, respondents were asked where primarily they purchase their meats. Traditional grocery stores were most often reported, followed by warehouse stores (such as Costco), specialty meat stores, natural food stores, making purchases directly from a farm, and making purchases over the Internet.

One potential issue in stated preference studies is that respondents often overestimate their WTP or purchase goods and services, viewing the survey questions as hypothetical, which results in survey bias. In an effort to control hypothetical bias, four survey treatments were used, including one using a "cheap talk" script, which advises respondents of the potential for hypothetical bias and asks that they consider their true preferences and budgetary constraints. A basic cheap talk script has been shown to greatly reduce differences between hypothetical and non-hypothetical WTP estimates (Silva, Nayga, Campbell & Park, 2011). The second treatment included an auction script that explained how auctions work and how they encourage participants to bid their true WTP. The third treatment incorporated both the cheap talk and auction scripts, and the final treatment, a control treatment, provided no script or additional information.

To minimize reference point effects, a double-bounded contingent valuation and payment card hybrid design was used, similar to that of Hu (2006) and Hu, Zhong, and Ding (2006). Each respondent was asked to complete two payment cards, such as one card for the New York steak (often called strip steak) cut and a second card for

Table 1: Attribute Ratings and Factor Analysis Results (ratings on a 1–5 scale)

Attribute	Mean Attribute Rating	FactorName			
		CREDENCE	EXPERIENCE	APPEARANCE	MARKETING
Naturally raised/produced	3.56	0.894			
Produced following environmentally friendly practices	3.64	0.870			
Organic	3.46	0.804			
Certified as following humane animal treatment standards	3.76	0.737			
Feed type	3.52	0.730			
Origin	3.03	0.666			
Taste and flavor	4.69		0.901		
Freshness	4.70		0.885		
Tenderness	4.42		0.759		
Safety assurances	4.53		0.694		
Leanness	4.20		0.624		
Marbling	3.62			0.737	
Muscle texture	3.55			0.729	
Sold under familiar brand name	2.79			0.530	
Cut type	3.91			0.509	
Sold under sale or promotion	3.29				0.837
Price	4.14				0.646
Packaging	3.53				0.561

the leg of lamb cut. Each payment card gave the respondent the opportunity to choose between the conventionally produced cut (Product A) and the N*evadaGrown* grass-fed/natural cut (Product B). If the respondent chose Product B (*NevadaGrown* grass-fed/natural), he or she was presented with four new prices increasing in US$0.25 increments from the original price offered and given the option to write in the highest price they would be willing to pay. If the respondents initially choose Product A (conventionally produced), they were asked to choose the highest price they would be willing to pay for Product B from a list of four prices in amounts decreasing from the original price offered in US$0.25 increments, with the option to write in the highest price they would be willing to pay.

The Product A prices represented the current local price for the meat type and cut under consideration. The Product B prices were drawn from a series of prices that were considered to be much lower, slightly lower, slightly higher, or much higher than the local average at the time of the study. Eight different combinations of prices were used. In total, there were 128 versions of the survey representing all possible combinations of meat cuts, information treatments, and pricing schedules, so that the survey design was fully orthogonal over the entire sample.

Model Estimation

Survey responses were analyzed following Lancaster's (1966) approach to consumer demand, which posits that when presented with product options, consumers will choose the product whose characteristics maximize their utility. Lancaster's theory states that that utility derived from consumption of a product is a function of the attributes of the product,

$$(1) \qquad U_{ij} = U_{ij}(z_1, z_2, ..., z_m)$$

where $z_i = a_{ij}\, q_j$ is the amount of the ith attribute achieved from consumption of the jth product, a_{ij} is the amount of the ith attribute per unit of the jth product, q_j is the quantity of the jth good consumed, and U_{ij} is the corresponding utility level derived through that consumption (Gracia & de Magistris, 2008). Consumers are then assumed to choose the product with the attribute mix that maximizes their utility. In this case, consumers were presented with two products, the differentiated (*NevadaGrown* grass-fed/natural) meat product (Product B) and the conventionally produced product (Product A). The probability of a consumer choosing the differentiated product is dependent on the probability that the utility derived from consumption of the differentiated product is greater than the utility derived from consumption of the conventional product,

$$(2) \qquad P(y_d) = P(U_{id} > U_{ic}).$$

Two logit models were estimated using respondent socio-demographic data, meat purchasing habits, and four variables related to preferences for meat attributes obtained through factor analysis of the original 18 attributes. In the first model, the dependent variable was willingness to purchase the differentiated meat products (with a value of 1 if the respondent was willing to purchase the *NevadaGrown* grass-fed product, 0 otherwise), while the second model included the same independent variables with willingness to pay a premium as the dependent variable (with a value of 1 if the respondent was willing to pay a premium for the differentiated meat, 0 otherwise). The models were estimated as

$$(3) \qquad \mathbf{y} = \mathbf{x'\beta} + \varepsilon \text{ where } \varepsilon \sim N[0,1],$$

such that the probability of a "yes" response (i.e., willing to purchase or willing to pay a premium) is

$$(4) \qquad \text{Prob}\,(Y = 1 \mid \mathbf{x}) = \frac{e^{\mathbf{x'\beta}}}{1 + e^{\mathbf{x'\beta}}}.$$

Consumer WTP for each meat type was estimated with WTP for the differentiated meat as the dependent variable and the highest price the respondent was willing to pay as the independent variable, such that

$$(5) \qquad \text{WTP} = \alpha - \rho \cdot x_i,$$

where a is the slope of the function (the coefficient on the constant) and ρ is the coefficient on the bid. Following this, mean WTP was calculated as

$$(6) \qquad \overline{\text{WTP}} = \frac{-\alpha}{\rho}.$$

The logit analysis incorporated four factors obtained through factor analysis performed on the 18 meat attributes that respondents rated in terms of perceived importance in their meat purchasing decisions. Principal components factor analysis with varimax rotation and Kaiser normalization was used to extract the four factors. Factor loadings and the attributes embodied by each factor are summarized in table 2.

The first factor contained the statements pertaining to natural production, environmentally friendly production, organic production, certified humane production, livestock feed type, and geographical origin of the meat. As these components are all related to production protocols, and are all considered credence attributes, this factor was given the name "CREDENCE." The second factor contained the attributes of taste and flavor, freshness, tenderness, safety assurances, and leanness. As these attributes are all considered experience attributes (elements of a product that can only be detected through consumption), this factor was called "EXPERIENCE." The third factor contained the attributes of marbling of meat, muscle texture, brand name, and cut type, so the factor was given the name "APPEARANCE," as these attributes can all be considered appearance attributes (attributes that can be noted from inspection of the product). The final factor contained two cost attributes (the importance of meat being sold under a sale or promotion and the price of meat) as well as the meat product's packaging and was termed "MARKETING," as these components all relate to marketing techniques.

In addition to the four factors, we included variables "NATURALSTORES," a measure of how often the respondent purchases meat at natural food stores, and "SPECIALTYMEAT," a measure of how often the respondent purchases meat at specialty meat stores (such as butcher shops). Demographic variables included "FEMALE," "EDUCATION," "INCOME," "MARRIED," "KIDS" (children 18 and under in household), "AGE," "WHITE," and "HHSIZE" (household size). Finally, "CHEAPTALK," "AUCTION," and "BOTH" were included to examine the effects of these scripts on respondent WTP. All model variables are summarized in table 2, and the final model was estimated as

$$\begin{aligned}\mathbf{y}_d = {} & \beta_0 + \beta_1 \text{CREDENCE} + \beta_2 \text{EXPERIENCE} + \beta_3 \text{APPEARANCE} \\ & + \beta_4 \text{MARKETING} + \beta_5 \text{NATURALSTORES} + \beta_6 \text{SPECIALTYMEAT} \\ & + \beta_7 \text{FEMALE} + \beta_8 \text{EDUCATION} + \beta_9 \text{INCOME} + \beta_{10} \text{MARRIED} \\ & + \beta_{11} \text{KIDS} + \beta_{12} \text{AGE} + \beta_{13} \textit{WHITE} + \beta_{14} \text{HHSIZE} + \beta_{15} \text{CHEAPTALK} \\ & + \beta_{16} \text{AUCTION} + \beta_{17} \text{BOTH} + \varepsilon \end{aligned} \quad (7)$$

where $\mathbf{y}_d$ is the probability of a consumer's willingness to purchase the differentiated meat product (Product B) in the first analysis ($d=1$), and consumer WTP a premium for the differentiated meat product (Product B) in the second analysis ($d=2$). The two-model analysis was conducted to provide more detailed information on those consumers' WTP premiums for the Product B option meat products.

Model Results

The results of the two logit models are provided in the appendix: table A1 (willingness to purchase Product B) and table A2 (willingness to pay a premium for Product B). The results show differences in willingness to purchase and WTP a premium between the beef, lamb, and pork products. "CREDENCE," the factor related to differentiated meat production attributes, including both feed type and point of origin, had positive and significant effects on willingness to purchase and WTP a premium for the differentiated steak and ground beef products (12.2 percent and 8.5 percent for steak, 17.7 percent and 7.2 percent for ground beef), but did not have an effect on willingness to purchase or WTP a premium for either leg of lamb or pork chops. This is perhaps due to the prevalence of grass-fed and origin-labeled beef products, which are increasingly common in conventional grocery outlets, while similarly produced lamb and pork products are not yet so visible.

Meat "APPEARANCE" attributes had a positive and significant effect on consumer willingness to purchase across all meat types and ranged in effect from increasing the probability of willingness to purchase by 6.5 percent for steak to 8.9 percent for leg of lamb. It was also positive and significant in the WTP a premium stage for New York steak and pork chops at 6.1 percent and 7.9 percent, respectively, indicating that despite the

Table 2. Model Variable Descriptions and Statistics

Variable	Description	Mean	Std. Dev.
Steak	1 if willing to purchase differentiated steak product; 0 otherwise	0.61	0.48
Ground Beef	1 if willing to purchase differentiated ground beef product; 0 otherwise	0.61	0.49
Pork Chops	1 if willing to purchase differentiated pork product; 0 otherwise	0.56	0.49
Leg of Lamb	1 if willing to purchase differentiated lamb product; 0 otherwise	0.45	0.49
NATURALSTORES	1: Never purchase meat at natural food stores	2.1	0.55
	2: Sometimes purchase meat at natural food stores		
	3: Frequently purchase meat natural food stores		
SPECIALTYMEAT	1: Never purchase meat at specialty meat stores	2.25	0.55
	2: Sometimes purchase meat at specialty meat stores		
	3: Frequently purchase meat at specialty meat stores		
FEMALE	1 if female; 0 otherwise	0.56	0.5
EDUCATION	1: Completed middle school	3.96	1.34
	2: Completed high school		
	3: Some college		
	4: 2-year degree		
	5: 4-year degree		
	6: graduate degree or higher		
INCOME	1: less than $30,000	3.64	1.67
	2: $30,000-$45,000		
	3: $45,000-$60,000		
	4: $60,000-$75,000		
	5: $75,000-$100,000		
	6: more than $100,000		
MARRIED	1 if married; 0 otherwise	0.63	0.48
KIDS	1 if children under 18 in household; 0 otherwise	0.31	0.46
AGE	1: 18-25 years	4.16	1.37
	2: 26-35 years of age		
	3: 36-45 years of age		
	4: 46-55 years of age		
	5: 56-65 years of age		
	6: 66-75 years of age		
	7: 75 and older		
WHITE	1 if White; 0 otherwise	0.81	0.39
HHSIZE	1: 1-2 household members	1.49	0.7
	2: 3-4 household members		
	3: 5-6 household members		
	4: 7 or more household members		
RETIRED	1 if Retired; 0 otherwise	0.75	0.44
FT EMPLOYED	1 if employed full time; 0 otherwise	0.59	0.49
RESIDE NORTH	1 if household in northern Nevada; 0 otherwise	0.42	0.41
CHEAPTALK	1 if received cheap talk treatment; 0 otherwise	0.22	0.42
AUCTION	1 if received auction treatment; 0 otherwise	0.26	0.44
BOTH	1 if received cheap talk + auction treatment; 0 otherwise	0.22	0.41

consumer shift in demand towards credence attributes, appearance attributes still play a key role in providing consumers with perceived quality cues. This is a valuable result for producers considering direct marketing who may not have as much experience producing a consistent finished product: not only will the appearance of a meat product affect a consumer's purchase decision; for some products it may also be a deciding factor in whether or not they are willing to pay a premium.

Although product experience attributes such as taste, flavor, and freshness were assigned the highest average preference ratings by respondents, "EXPERIENCE" yielded a significant effect only on willingness to purchase the differentiated ground beef (5.6 percent), and had no effect on WTP a premium for any product. This may be an indication that taste and flavor are less important to consumers when it comes to purchasing meat products than credence attributes such as feed type and origin, although both attributes have been found to affect taste and flavor.

"MARKETING" attributes had a negative and significant effect on willingness to purchase the differentiated leg of lamb (6.7 percent), which is not unexpected as the components of this factor were related to price and packaging. It is expected that consumers who place an emphasis on these aspects will be less inclined to purchase a potentially pricier product, and leg of lamb is not widely consumed in the U.S. The result for "SPECIALTYMEAT" (purchasing meat primarily from a specialty meat store) was significant only for New York steak, the most expensive cut of meat included in the survey, and increased the probability of willingness to purchase locally grown, grass-fed New York steak by10.9 percent and WTP a premium by 13.7 percent. Purchasing meats from a natural foods store ("NATURALSTORES") had no significant effects in either stage. Taken together, these results tend to indicate that meat purchasing outlets do matter, but perhaps only for certain cuts.

Annual consumer income ("INCOME") had a positive and significant effect on willingness to purchase all differentiated meat types except pork chops, with the marginal effect ranging from 5.1 percent to 7.8 percent for each US$15,000 increase in household income. Income remained positive and significant for WTP a premium for both New York steak and ground beef.

"EDUCATION" level was negative and significant for ground beef and leg of lamb for consumer willingness to purchase (4.5 percent and 5.5 percent, respectively), but had no effect on consumer WTP a premium. "AGE" was negative and significant for New York steak and ground beef at both stages (negative effect of 4.7 percent to 7.8 percent for an additional 10 years of age), indicating that younger adults were more willing to purchase and pay premiums for differentiated beef products. This result is consistent with previous studies on consumer preferences for grass-fed beef (Umberger et al., 2009), which demonstrate the reluctance of older adults to incorporate new foods into their diet (Pollak, 1970).

"WHITE" had positive and significant effects on consumer WTP a premium for the differentiated steak, lamb, and pork products, but had no effect on consumer willingness to purchase any of the products, which may be related the lack of ethnic diversity in the sample (81 percent of respondents identified themselves as White). The presence of children in the household ("KIDS") had a positive and significant effect on consumer willingness to purchase the differentiated leg of lamb and pork chop products, with marginal effects of 32 percent and 21 percent, respectively, and WTP a premium for the lamb product. This is consistent with previous literature, which finds that the presence of children in the household leads to increased consumer WTP for differentiated products, such as organic and local foods (Batte, Hooker, Haab, & Beaverson, 2006; Yue & Tong, 2009).

Household size had a significant negative effect for pork chops (12.6 percent) in the first stage and leg of lamb at both stages, indicating that two additional household members would decrease the probability of purchasing and paying a premium for the state-labeled, grass-fed lamb by 23.9 percent and 28.8 percent, respectively. Xue et al. (2010) had a similar result for grass-fed beef, which was not the case here. This outcome is likely related to the fact that having children in the household was a discrete 0/1 variable, only capturing whether or not the respondent had children in the household as opposed to the number of children. Small families with children may be more willing and able to purchase and pay a premium for differentiated products while larger families with or without children may be constrained.

The survey treatment "BOTH" that incorporated both the cheap talk and the auction script, as well as the treatment with the cheap talk script only, "CHEAPTALK," had a negative and

significant effect on willingness to purchase differentiated ground beef (17.4 percent and 17.7 percent), but no effects on consumer WTP a premium across meat types. The "AUCTION"-only script increased the probability of WTP a premium for ground beef by 12.3 percent and for lamb decreased the probability of purchase by 14.6 percent. These results demonstrate a lack of uniformity in the effects of these measures to reduce hypothetical bias.

WTP Estimation Results

Mean WTP for each differentiated meat product is given in table 3 for the entire sample, as well as for those respondents only WTP a premium for the product. For New York steak, mean WTP was US$7.96/lb., or a premium of 33 percent relative to the offered base price of US$6.00/lb. Sixty-five percent of the respondents were willing to pay more than US$6.00 per pound for the New York steak, and their WTP on average was US$8.38/lb., or a 40 percent premium over the base price. For differentiated ground beef, average WTP over all respondents was estimated as US$2.42, a 21 percent premium over the base price of US$2.00/lb. and a considerable premium for an inferior meat cut. The magnitude of this premium may be related to the lower starting value, as was suspected by Loureiro and Umberger (2003) when comparing WTP premium amounts for COOL-labeled hamburger and steak. In total, 73 percent of respondents were willing to pay a premium for the ground beef, while 85 percent were willing to pay at least the base price of US$2.00/lb. Pork chops, the most widely consumed cut of pork, had a mean WTP of US$3.42, a 14 percent premium over the base price of US$3.00/lb. Seventy percent of respondents were willing to pay a premium over the base price.

While the average WTP for leg of lamb over all respondents was US$4.81, a 4 percent discount from the base price, WTP among those respondents who were willing to pay a premium was US$5.54, a premium of 11 percent. Fifty-two percent of respondents were willing to pay a premium for the grass-fed lamb product, while 61 percent were willing to pay at least the base price. The relatively lower percentages of persons willing to pay at least the baseline amount may be reflecting preferences for lamb meat, which is not consumed as widely in the U.S. as in other countries.

Discussion and Conclusions

Overall, the study results indicate a definite market for state origin-labeled differentiated pork and lamb products, especially among higher income, married Whites with one or two children. Results show price premiums ranging from 11 to 15 percent for local lamb and pork products (and 22 to 40 percent for local grass-fed beef products). However, the perceived importance of credence characteristics (such as production methods, labels, etc.) had little impact on purchase propensity for pork and lamb products in our sample. Credence characteristics did have positive and significant effect for the differentiated New York steak and ground beef products. This may be an indication that consumers are more influenced or aware of production protocols in beef products, and perhaps less aware or less concerned with conventional production methods for pork and lamb. For all meats, appearance attributes had a positive and significant effect on willingness to purchase the differentiated product and WTP for the pork and steak product. This confirms the overall importance of the quality cues consumers receive from the products' visual appearance. Marketing and experience attributes had little impact on either willingness to purchase or WTP, indicating that appearance or credence attributes may be more

Table 3. WTP Estimates for "All" Respondents and Those Willing to Pay a "Premium" (All US$)

Product	NY Steak		Ground Beef		Pork Chops		Leg of Lamb	
Consumer Sample	All	Premium	All	Premium	All	Premium	All	Premium
Product B Mean WTP ($/lb)	$7.96	$8.38	$2.42	$2.43	$3.42	$3.46	$4.81	$5.54
Product A Price ($/lb)	$6.00	$6.00	$2.00	$2.00	$3.00	$3.00	$5.00	$5.00
Discount/Premium (%)	33%	40%	21%	22%	14%	15%	-4%	11%

important than taste or flavor when making differentiated meat purchases.

Our results show that demographics continue to play a role in consumer preferences for differentiated products. Demographic effects were similar in both stages of the analysis, with a couple of exceptions. The most notable was ethnicity, which was significant only in the WTP a premium model. Demographic effects were more significant for the lamb product, while younger adults and higher-income effects were more prevalent for the two beef products. These results show that targeting specific consumers may be especially important for uncommon products, such as lamb, where consumers have less consumption history. Also, providing information on the health benefits of specialized production methods (natural, organic, grass-fed) may appeal to the growing senior population in the United States.

The WTP estimates differed across the meat products under examination. While mean WTP over all respondents represented a significant premium for the differentiated steak, ground beef, and pork chops, the entire sample was willing to accept a slight discount for the differentiated leg of lamb product. As leg of lamb is already a higher-priced product, consumers may not find as much additional value in a differentiated product. However, at least two-thirds of the respondents were willing to pay the prevailing conventional product price for the differentiated lamb product.

Finally, the effect of survey design on measuring willingness to purchase and WTP is noted. The auction script had a significant negative marginal effect on willingness to purchase lamb, and the "BOTH" treatment (both the auction script and the cheap talk script) had a significant negative effect on ground beef, which was the expected result. By contrast, the auction script had a significant positive effect on WTP a premium for ground beef. Hence, the effects of the cheap talk, auction, and both cheap talk and auction treatments were not uniform across respondents. However, there were several other survey design features present, including the prices respondents received, as well as the order in which both prices and products were presented. It is possible that including only the script treatments, as we have done in this study, does not capture the full effects of the survey design.

This study sheds light on consumer preferences for multiple state origin–labeled differentiated meat products in the western United States. However, due to nonhomogeneous attitudes and knowledge of alternative livestock production methods, as well as differences in ethnic background, consumer preferences will likely differ across regions. Further research clarifying differences across regions and through time would provide more specific information on the potential risks and returns to livestock producers involved in producing and marketing differentiated meat products. Although consumer perceptions of product experience attributes, such as taste and flavor, were not significant in this study, the inclusion of sensory analysis in future studies to link actual consumption experience with WTP estimates may provide additional validity to these results.

Acknowledgments

This research was supported by the Utah Agricultural Experiment Station, Utah State University, and approved as journal paper number 8380, as well as the Nevada Agricultural Experiment Station and USDA Rural Development. The author would like to thank Margaret Cowee, Wuyang Hu, and Steven Lewis for their assistance, as well as three anonymous reviewers for their helpful suggestions.

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Appendix

Table A1. Consumer Willingness to Purchase Model Results (Logit)

	NY Steak			Ground Beef			Leg of Lamb			Pork Chops		
Variable Name	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect
CREDENCE	0.521***	0.145	0.122***	0.765***	0.155	0.177***	0.166	0.150	0.041	0.044	0.146	0.011
EXPERIENCE	0.202	0.133	0.047	0.241*	0.134	0.056*	–0.134	0.143	–0.033	0.089	0.136	0.022
APPEARANCE	0.280**	0.137	0.065**	0.286**	0.141	0.066**	0.358**	0.150	0.089**	0.347**	0.144	0.085**
MARKETING	0.060	0.145	0.014	0.028	0.150	0.006	–0.271*	0.142	–0.067*	–0.148	0.140	–0.036
NATURALSTORES	0.353	0.280	0.082	–0.157	0.285	–0.036	–0.079	0.249	–0.020	–0.029	0.245	–0.007
SPECIALTYMEAT	0.467*	0.245	0.109*	0.314	0.249	0.072	–0.048	0.268	–0.012	0.048	0.267	0.012
FEMALE	–0.178	0.289	–0.041	0.040	0.298	0.009	–0.155	0.292	–0.038	0.251	0.289	0.061
EDUCATION	–0.077	0.113	–0.018	–0.200*	0.116	–0.046*	–0.221**	0.113	–0.055**	–0.138	0.112	–0.034
INCOME	0.312**	0.109	0.073***	0.339***	0.111	0.078***	0.206**	0.099	0.051**	0.039	0.098	0.010
MARRIED	–0.062	0.306	–0.015	0.098	0.316	0.023	0.095	0.318	0.023	0.653**	0.310	0.160**
KIDS	0.335	0.485	–0.079	–0.081	0.508	–0.019	1.321**	0.522	0.319***	0.891*	0.495	0.209*
AGE	–0.257**	0.126	–0.060**	–0.224*	0.129	–0.052*	0.009	0.119	0.002	–0.046	0.116	–0.011
WHITE	0.470	0.337	0.113	0.196	0.344	0.046	0.353	0.389	0.086	0.360	0.371	0.089
HHSIZE	–0.309	0.301	–0.072	–0.185	0.315	–0.043	–0.968***	0.342	–0.239***	–0.513*	0.316	–0.126*
CHEAPTALK	–0.040	0.384	–0.009	–0.723*	0.397	–0.174*	–0.173	0.383	–0.042	–0.385	0.378	–0.095
AUCTION	0.571	0.385	0.127	0.511	0.416	0.113	–0.606*	0.377	–0.146*	–0.480	0.367	–0.118
BOTH	0.373	0.361	0.085	–0.742**	0.366	–0.177**	–0.531	0.426	–0.127	0.259	0.428	0.063
CONSTANT	–0.909	1.342		0.949	1.375		1.244	1.365		0.674	1.351	
Observations	282			282			259			259		
Pseudo R2	0.1227			0.1633			0.1048			0.0799		
Log likelihood	–165.46			–157.42			–159.63			–163.25		

***,**,*: Statistically significant at the 1%, 5%, and 10% confidence levels, respectively.

Table A2. Consumer WTP Premium Model Results (Logit)

	NY Steak			Ground Beef			Leg of Lamb			Pork Chops		
Variable Name	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect	Coefficient	Standard Error	Marginal Effect
CREDENCE	0.384***	0.144	0.085***	0.392***	0.150	0.072***	−0.021	0.144	−0.005	0.075	0.156	0.015
EXPERIENCE	0.050	0.132	0.011	0.143	0.134	0.026	−0.008	0.138	−0.002	0.087	0.144	0.017
APPEARANCE	0.277**	0.140	0.061**	0.223	0.147	0.041	0.215	0.141	0.054	0.398**	0.157	0.079***
MARKETING	−0.124	0.149	−0.027	0.099	0.156	0.018	−0.027	0.137	−0.007	−0.152	0.158	−0.030
NATURALSTORES	0.271	0.281	0.060	−0.300	0.295	−0.055	0.161	0.242	0.040	−0.260	0.270	−0.052
SPECIALTYMEAT	0.621**	0.246	0.137**	0.344	0.260	0.063	0.102	0.261	0.026	0.289	0.298	0.058
FEMALE	−0.014	0.291	−0.003	−0.185	0.310	−0.034	0.053	0.285	0.013	0.452	0.314	0.091
EDUCATION	0.018	0.114	0.004	−0.066	0.122	−0.012	−0.106	0.110	−0.026	−0.058	0.122	−0.012
INCOME	0.189*	0.106	0.042*	0.301***	0.116	0.055***	0.130	0.097	0.033	0.036	0.106	0.007
MARRIED	0.141	0.304	0.031	−0.189	0.328	−0.035	−0.174	0.310	−0.043	0.107	0.335	0.021
KIDS	−0.012	0.504	−0.003	0.170	0.543	0.031	1.095**	0.508	0.262**	0.265	0.526	0.052
AGE	−0.353***	0.131	−0.078***	−0.254*	0.136	−0.047*	−0.040	0.115	−0.010	−0.067	0.127	−0.013
WHITE	0.788**	0.336	0.184**	0.455	0.350	0.089	0.877**	0.380	0.214**	1.273***	0.383	0.288***
HHSIZE	−0.349	0.310	−0.077	−0.315	0.336	−0.058	−1.152***	0.339	−0.288***	−0.284	0.331	−0.057
CHEAPTALK	−0.038	0.396	−0.008	−0.203	0.403	−0.039	0.289	0.378	0.072	−0.035	0.410	−0.007
AUCTION	0.339	0.393	0.072	0.753*	0.448	0.123*	0.029	0.360	0.007	−0.316	0.389	−0.065
BOTH	−0.197	0.362	−0.044	−0.347	0.374	−0.066	0.093	0.412	0.023	0.574	0.483	0.105
CONSTANT	−0.728	1.361		1.465	1.430		0.244	1.335		0.205	1.457	
Observations	282			282			259			259		
Pseudo R2	0.1126			0.0954			0.0716			0.0931		
Log likelihood	−162.19			−148.66			−166.44			−142.94		

***,**,*: Statistically significant at the 1 percent, 5 percent, and 10 percent confidence levels, respectively.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
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Resource-use and partial-budget analysis of a transition to reduced-input and organic practices and direct marketing: A student-farm case study

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Submitted May 27, 2013 / Revised August 11, September 29, and November 26, 2013 / Accepted November 26, 2013 / Published online February 27, 2014

Citation: Clark, S. (2014). Resource-use and partial-budget analysis of a transition to reduced-input and organic practices and direct marketing: A student-farm case study. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 113–130. http://dx.doi.org/10.5304/jafscd.2014.042.005

Abstract

The Berea College student farm undertook a transition to alternative practices in an effort to improve the sustainability of its operations, which included an expansion of organic crop production, a transition to reduced-input cattle and hog production, and a shift toward local marketing and sales, particularly of value-added products. The changes, developed and planned by students, staff and faculty in 2007, were implemented in 2008–2009 and fully in place by 2010. The plan required a reduction in livestock herd sizes, creating less dependence on purchased off-farm inputs, such as livestock feedstuffs and fertilizers for growing animal feed-crops. Third-party certifications, including USDA Certified Organic and Animal Welfare Approved, facilitated access to price premiums and new markets. Selling more meat and fewer live animals resulted in financial gains for the livestock enterprises, but the greatest returns were generated through organic horticultural production. Questions remain about the environmental, social, and animal-welfare trade-offs from the transition, but it clearly resulted in financial improvements and reduced dependence on off-farm inputs. This paper quantitatively documents the effects of the initiatives and illustrates the interdependencies among the changes to the whole-farm system.

Keywords

direct marketing, grass-finished beef, low-input farming, organic farming, outdoor hog production, student farm, value-added

Introduction

Transitioning to alternative production, marketing, and sales practices for improved sustainability may bring financial risk as well as potential long-term benefits to farms. Economic incentives, such as

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price premiums and stronger market demand, may exist for products grown or raised according to particular rules, such as certified organic or humanely raised. Shorter supply chains also offer opportunities for adding value, in part by communicating with customers the story behind the products. But during transition periods, which may last for several years, there are often no premiums, markets may be difficult to find or establish that pay any premium, and actual conditions and outcomes for the farm and/or market may differ from those of controlled field experiments or modeling exercises, which are often important sources of technical information to producers. Farm case studies have value in providing insights into how real-world complexity and unique local conditions can affect how transitions play out and whether predictions and expectations are realized. Student farms, operated on increasing numbers of college and university campuses, provide venues for such case studies since they often use unconventional practices, have many individuals participating and making observations, maintain thorough management records, are not rigorously controlled or narrowly focused on single variables like replicated field experiments, and can sometimes take risks that private, family farms cannot afford (Sayre & Clark, 2011). There are drawbacks as well, such as distinguishing between educational activities and production work, and the fact that such farms may be protected from land payments, taxes, and other costs that private farms face.

This paper reports on the impetus, planning, implementation, and results of an effort to address concerns about sustainability on the Berea College Farm, the experiential-learning laboratory of the college's academic program in agriculture and natural resources. The implementation of the changes in 2008 and 2009 included an expansion of organic crop production to partially replace conventional production, a transition to reduced-input livestock production, and a greater emphasis on local marketing and sales with a particular focus on adding value to raw farm products (table 1). The effects of the initiatives on the farm's dependency on off-farm resources and its financial performance, as well as the mutual dependencies among the three initiatives, are examined.

Table 1. Initiatives Implemented on the Berea College Farm to Address Sustainability Concerns

Initiative	Main Issues Targeted	Expected Performance Outcomes
Expansion of organic crop production	• Potential negative environmental and health effects of fertilizers and pesticides	• Reduce risk of water and air pollution • Reduce risk to human health • Receive premiums for organic foods • Reduce material input costs
Transition to outdoor hog production and grass-finishing cattle	• Small-scale confinement hog production unprofitable and many consider it inhumane • Feeding ruminants grain is unnecessary and energetically expensive; pasture can be produced with few inputs	• Recycle soil nutrients (especially nitrogen) • Reduce nonrenewable energy use • Reduce capital costs of hog production • Model a more viable option for small farmers • Eliminate subtherapeutic antibiotic use in feed • Improve animal welfare • Reduce environmental impact by feeding cattle grasses and forages rather than grain • Reduce feed costs • Reduce need for corn grain • Gain access to specialty meat markets
Shift toward local marketing and sales, particularly of value-added products	• Difficulty in achieving small-farm financial viability because commodity production is unprofitable for small to medium-sized farms	• Add value to lower-value commodities • Develop market demand for local, artisanal food products • Reduce "food miles" • Increase local food availability and diversity • Increase consumer understanding of agriculture

Methods

This analysis is based on farm records collected throughout the implementation of the initiatives. The records included all expenses for material inputs and services, sales of all crop and livestock products to different markets, the number of acres allocated to various crops (field, forage, and horticultural) and livestock species, and the amount of acreage under organic management during the transition period. Interviews with the farm manager helped provide context and explanations for quantitative data.

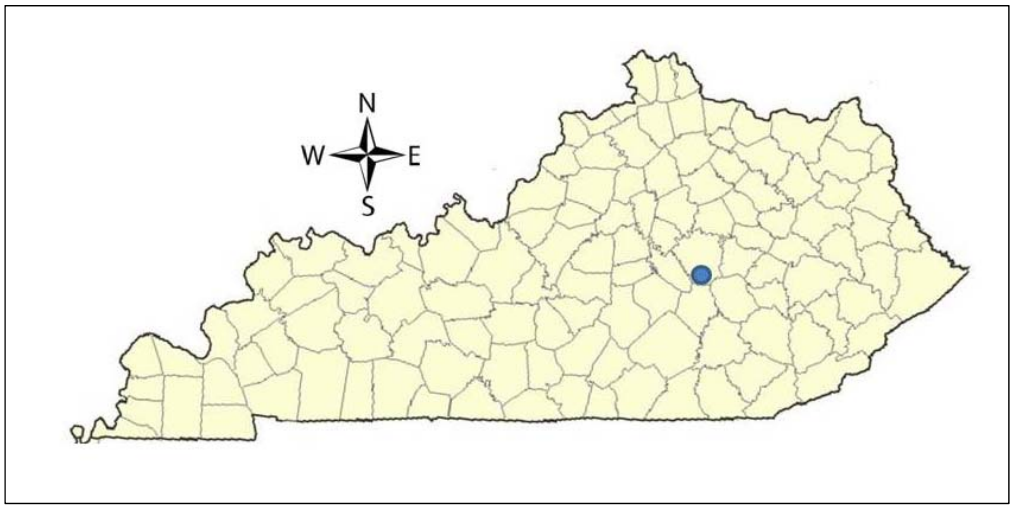
Due to the nature of the college's educational labor program it was not feasible to accurately record the labor inputs for each enterprise because of the inability to clearly delineate between educational and production activities. However, the total amount of labor on the whole farm was constant during the study period. There were approximately 45 students working on the farm for 10 hours per week during each academic year and 6 to 8 students working full-time during each summer. More than 100 different students worked on the farm at some point during the study period. Because students had to be trained and instructed by staff before safely using equipment or carrying out new tasks, distinguishing between the amount of time spent learning and spent "doing" was practically impossible, which changed not only seasonally but often daily.

Thus, partial budgets were constructed for individual enterprises and the whole farm that included all material input purchases and product sales, but not labor inputs. Partial-budget analyses are used to compare alternative options for a farm business, like adopting a new technology, changing enterprises, or modifying production practices (Roth & Hyde, 2002). Aspects of the farm budget that remain unchanged (in this case, labor inputs) can be left out of the analysis. The goal of this analysis was to assess the trajectory of the whole-farm system with respect to its dependence on off-farm inputs and financial performance as measured by gross income minus input costs.

The Farm Before Transition

The Berea College Farm at Berea College, located in Berea, Kentucky, a city of 13,763 people (U.S. Census Bureau, n.d.) and established in the 1870s, is one of the oldest continuously operating student educational farms in the U.S. (figure 1). Like most student farms, it had modest beginnings which first took the form of student initiatives and learning projects, but developed over decades into multiple, integrated, and commercially viable enterprises on hundreds of acres of land around the campus and city of Berea. The farm's enterprises provided students with learning and work opportunities and generated some income to support the college. The farm also became an important source of some food products for the campus dining hall and the surrounding community. As is still the case today, students were involved in all aspects of the farm's daily operations throughout the

Figure 1. Location of the Berea College and its Student Farm
The Berea College Farm is in Berea, Kentucky, in a region known as the Knobs, between the Bluegrass and the Appalachian foothills (also known as the Eastern Kentucky Coal Fields)



year. The composition of the farm's enterprises and their relative scale have changed over the farm's 140-year history in response to socio-politico-economic factors, technological changes, student and faculty interest, and available expertise and resources, but have included beef cattle, dairy cattle, sheep, goats, poultry, field crops, and horticultural crops (Clark, 2011).

By the 1990s the farm had closed its dairy and poultry operations, which for decades had produced milk and eggs for local and regional markets. These systems were replaced with conventional meat-livestock production for commodity markets, a reflection of the larger agricultural economy of Kentucky, where over two-thirds of farm gross receipts are for livestock and most of the remainder is for crops like corn and soybean used to feed livestock (USDA National Agricultural Statistics Service [NASS], 2008). At the beginning of the study period most of the student farm's available land — 412 acres (167 ha) — was dedicated to the production of beef cattle, hogs, sheep, or goats and their feed crops. Only about one percent of the farm's land resources was in horticultural crops, including community gardens.

This use of the farm's land not only mirrors Kentucky's agriculture; it is also fairly consistent with land capability classifications according to the USDA soil survey. An analysis of the farm's land resources using a model developed by Holder (2011) to assess Kentucky's human carrying capacity — factoring in land use classification, farmland classification, physiographic description, and flooding frequency — indicated that the most appropriate use for 80 percent of the farm's acreage was hay production and/or pasture. Much of the remaining 20 percent, land considered suitable for annual cropping, was dedicated to corn production to support the farm's three livestock enterprises: (1) hogs; (2) cattle; and (3) goats and sheep.

Production maximization rather than profitability was emphasized, if not as an explicit goal then at least in practice, to demonstrate the practices needed to achieve high productivity in a conventionally managed system. Though some effort was always made to generate sufficient revenues to cover operational costs, financial losses and budget overruns were common in the farm's history. The farm, of course, had no control over market prices or input costs, and production expenses often exceeded livestock commodity values. The losses were partially explained by the scales of the enterprises, which presumably were insufficient to achieve the economy of scale needed for profitability, and the students' lack of experience. But they were also justified as necessary costs for providing students with this practical educational experience. The products of the farm — mostly livestock on the hoof and some cash grains and hay — were considered byproducts of this educational program and were dispensed with in the most convenient way possible, even if it came at a loss.

Meat hogs that were produced using a conventional indoor confinement system were sold mostly to the nearest large corporate meatpackers, located over 100 miles (161 km) away in Louisville. Some hogs were sold locally: meat hogs for home processing and feeder pigs to other farmers when in excess of what the farm could manage. The rations fed to the hogs were produced with the farm's mill using corn produced on-farm, purchased soybean meal, and a premix with minerals, vitamins, and a subtherapeutic concentration of antibiotic. Corn was purchased when needed. Hog waste was flushed into lagoons and periodically sprayed into adjacent pastureland.

The cattle, sheep, and goats were sold mostly at a nearby stockyard, and some as frozen, custom-processed wholes, halves, and quarters to local customers. These few animals would be finished on-farm using a grain-based ration and silage and maintained in a small feedlot or barn. Efforts were made to produce as much feed as possible on-farm by supplying fertilizer and lime to corn, hay, and silage crops at rates recommended by cooperative extension, but when livestock numbers exceeded the farm's feed-production capacity, feed had to be purchased. This production-maximization approach kept the farm at the edge of thoroughly utilizing its land and crop-production capacity and frequently required off-farm feed purchases to make up for shortages.

Though students gained extensive hands-on experience in conventional livestock production

with this model, they were not privy to financial records and generally did not participate regularly in farm strategic planning and decision-making. The annual farm budget did not include student or staff wages, which were considered an educational cost, but it was expected to cover all nonpersonnel operational expenses with the income generated. These costs included material inputs (fertilizer, fuel, machinery, herbicides, pharmaceuticals, equipment, seed, semen, etc.) and services (veterinary visits, on-site repairs, custom harvesting, etc.). Any income generated in excess of the annual operating costs could be invested into needed infrastructural maintenance or special projects. But in most years some enterprises would lose money and need to be subsidized by other enterprises to ensure that the whole farm would meet its budget expectation or at least come close.

Origin of Change

By the early 2000s a complete turnover of faculty and staff occurred, largely as a result of retirements and new hires. There was also growing student demand for the farm to offer opportunities to learn and gain work experience in alternative agriculture, such as organic and biointensive systems (Jeavons, 2001). These requests came mostly from students with horticultural interests who saw a disproportionately large allocation of support and resources for livestock production on the farm and wanted larger food-system issues addressed. As a result, several horticulture projects gained support and were implemented, including a food-waste composting project (Clark & Cavigelli, 2005), a biointensive demonstration area, organic certification of about four acres (1.6 ha) of land for vegetables and fruits, and a 40-share community-supported agriculture (CSA) program.

Following these student-initiated efforts, students were given the opportunity to dedicate more of their weekly work hours to particular farm enterprises by becoming part of an enterprise management team with a faculty or staff mentor. This allowed them to become more engaged with what interested them most and to play a more active role in planning and decision-making. At about the same time, the faculty and staff of the college's Agriculture and Natural Resources department, which was responsible for overseeing the student farm, had delved into an overdue self-study to critically examine, revise, and update its academic program, including the student farm, which serves as its primary laboratory. During the process, which spanned nearly three academic semesters, the philosophical differences among faculty members were evident, but after months of discussion the group was able to agree on two general and overarching goals for the farm:

1. That it serve as a laboratory to provide students with practical learning experiences, and
2. That its enterprises be models of sustainable agricultural production in the region.

Though these left plenty of room for interpretation, all agreed that the farm should be a laboratory to build relevant skills and necessary knowledge for graduates who wanted to pursue farming as a livelihood or work in a career involving food and agriculture in this region, where small, resource-limited farms are the norm. The following four basic elements were established as the criteria for defining what would be meant by "sustainable agricultural production":

1. Environmental: minimizes the negative effects on water, air, soil, energy resources, human health, and ecosystem functions;
2. Economic: is based on sound financial management that results in reasonable and stable profits;
3. Social: creates desirable and safe work that instills a sense of pride and dignity; and
4. Humane: treats livestock with care and provides comfortable conditions during production.

These criteria were not especially precise, original, or innovative, but their inclusion in the self-study finally provided a framework for assessing the farm's performance, making decisions, and evaluating new ways of running enterprises to make them more applicable to today's markets. The self-study was finalized and approved by the college's administration in May 2007.

To implement the goals of the self-study, a visioning and planning workshop was held in the fall semester of 2007, to which all students working on the farm were invited, along with all staff and faculty affiliated with the farm, assuring that all stakeholders were offered the opportunity to be involved with the process. The objective of the event was to assess the farm and develop more specific goals for each of the five enterprises (hogs, beef cattle, goats/sheep, field crops, and horticultural crops). The group of about three dozen students, staff, and faculty contributed to developing short- and long-term goals in a process that emphasized transparency and democratized decision-making, planning, and allocation of resources. Three clusters of interdependent initiatives emerged from the process:

1. Expansion of organic crop production;
2. Transition toward low-input livestock production; and
3. Localization of marketing and sales with an emphasis on value-added products.

These initiatives supported the two overarching farm goals and were consistent with the four criteria defining sustainability, modeling more appropriate practices for small and medium-sized farms in the region. Plans were developed for each initiative and refined through weekly formal discussions among faculty and staff; weekly meetings of the student management teams and their faculty or staff mentor; and an annual visioning and planning workshop to assess progress and adapt to unanticipated events.

This analysis examines the whole-farm performance and focuses on the changes to the cattle, hogs, and horticulture enterprises — the three dominant enterprises of the farm based on income and/or use of land resources (table 2). Agronomic crops, including field crops and forages, are not addressed individually since they are regarded as part of the livestock/meat value chains. Any field crops produced as human food on a small scale, including corn, wheat, and dry beans, were included under the horticulture enterprise. The goat/sheep enterprise is also not addressed independently since it played a minor role in supporting the farm financially and few major changes were made to it as a result of these initiatives.

Expansion of Organic Crop Production

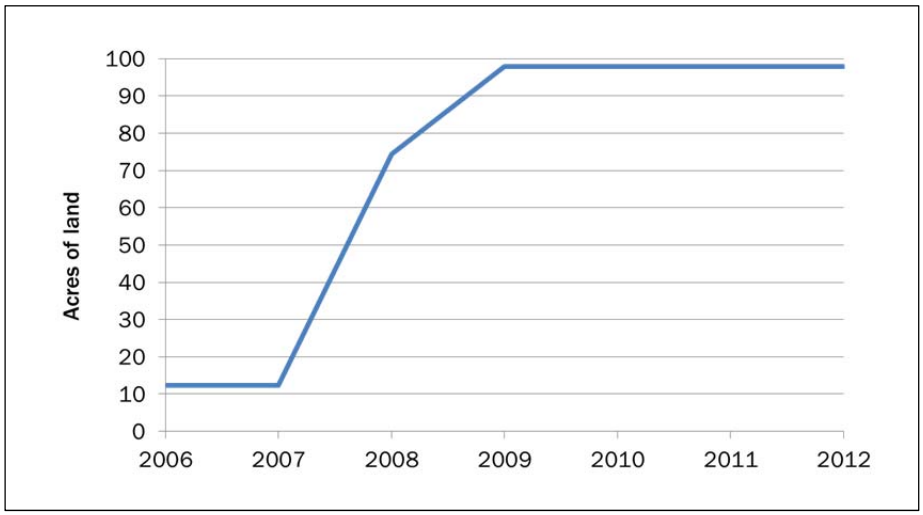
Organic crop production typically bases its farm plan on a number of synergistic environmental benefits that take soil, water, air, biodiversity, and human health into consideration (Gomiero, Pimentel, & Paoletti, 2011). Transitioning a larger portion of the college farm's cropland to organic management was intended to reduce the farm's use of and expenditures on fertilizers and herbicides; provide more flexibility for longer organic horticultural and agronomic crop rotations; generate more revenue by marketing certified organic field crops; open up the possibility for organic livestock production in the future; and improve soil quality over the long term by building soil organic matter. Trade-offs and challenges were expected and research indicated that agronomic crop yields would likely decline, at least for corn and possibly other grains, due to intensified weed competition and less predictable nitrogen availability (Badgley et al., 2007; Cavigelli, Teasdale, & Conklin, 2008; Clark, Klonsky, Livingston, & Temple, 1999; Pimentel, Hepperly, Hanson, Douds, & Seidel, 2005).

Table 2. Berea College Farm Enterprises, Average Percentage of Land Dedicated to Each, and Average Annual Gross Income During the Transition Period, 2007–2012

Enterprise	Percent of farm acreage [a]	Average annual gross income ($US)	Average annual gross income per acre (0.4 ha)
Hogs	17	$62,000	$868
Beef cattle	69	$57,000	$197
Horticulture	2	$40,000	$4,762
Field crops (sold off-farm)	6	$12,000	$476
Goats	6	$5,000	$198

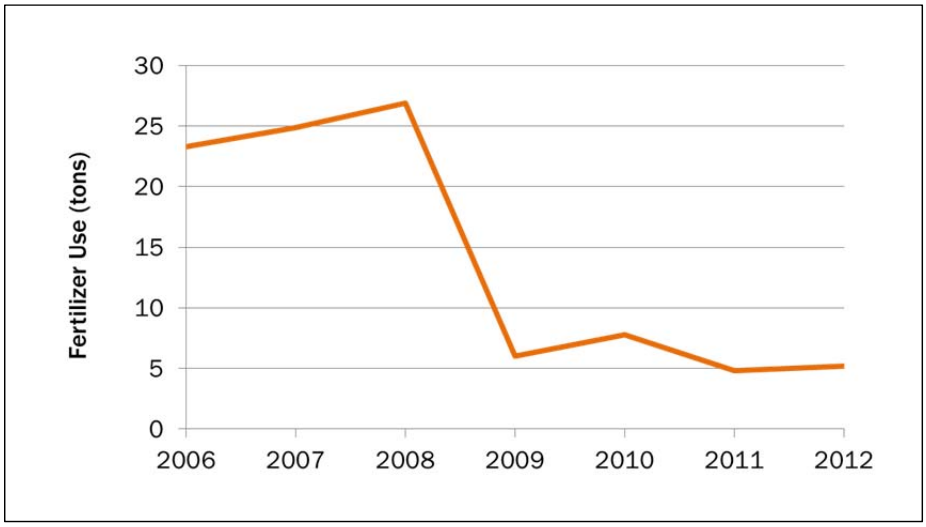
[a] Total farm acreage is 412 acres (167 ha)

Figure 2. Acreage of Land Managed Organically of the 412 Available Acres of the Berea College Student Farm, 2006–2012



Note: 1 acre = 0.4 ha

Figure 3. Synthetic Fertilizer Use on the Berea College Student Farm, 2006–2012



Note: 1 ton = 0.9 metric ton

These concerns were addressed proactively through transition plans with longer crop rotations, including several years of grass and legume mixtures grown as hay and/or pasture in between corn crops. This was intended to suppress populations of annual weeds like pigweed, lambsquarters, and velvet leaf and allow time for soil organic nitrogen to accumulate from legume fixation. It was also essential for soil fertility since composted manure would not be available with the elimination of confined livestock feeding. In order to accommodate these longer rotations the amount of acreage dedicated to corn, the most input-intensive crop, was reduced. This was accomplished by gradually reducing the size of the livestock herds and discontinuing feeding corn to ruminants (described in the next section). Cattle grazing and well-timed hay harvests were used to combat Johnsongrass, a perennial plant that had been difficult to manage even with conventional herbicides.

In 2007 the farm maintained about 12 acres (4.9 ha) of certified organic land. In 2008, following the planning and visioning workshop, another 62 acres (25 ha) were put under organic transition. In 2009, another 24 (9.8 ha) acres were added, for a total of 98 acres (40 ha) (figure 2). In order to accomplish this conversion in a manner that minimized risk and potential disruption to the farm, the new organically managed land was used mostly for hay production and cattle grazing during the three-year transition period. Most of the corn production was restricted to conventionally managed land where fertilizers and herbicides could continue to be used. Small plantings of corn within the organic acreage validated our concerns about yield losses. The organic corn generally yielded 20–30 percent less

than the conventional corn. It should be pointed out that no composted manure was applied to this corn — only green manure cover crops — since the farm was also phasing out all confined feeding, resulting in less manure accumulation. But other anticipated changes also occurred that were more desirable. By discontinuing all synthetic fertilizer use on organic land and reducing it on the conventional land when possible (particularly pastureland), the farm was able to reduce its total fertilizer use from about 25 tons (22.7 metric tons) per year to less than 8 tons (7.3 metric tons) per year (figure 3). This generated an annual savings of over US$10,000 (figure 4). Similarly, though less dramatically, annual herbicide expenses — primarily for pre-emergent and post-emergent herbicides for corn — dropped by about 30 percent.

Figure 4. Fertilizer Expenses (US$) on the Berea College Student Farm, 2006–2012

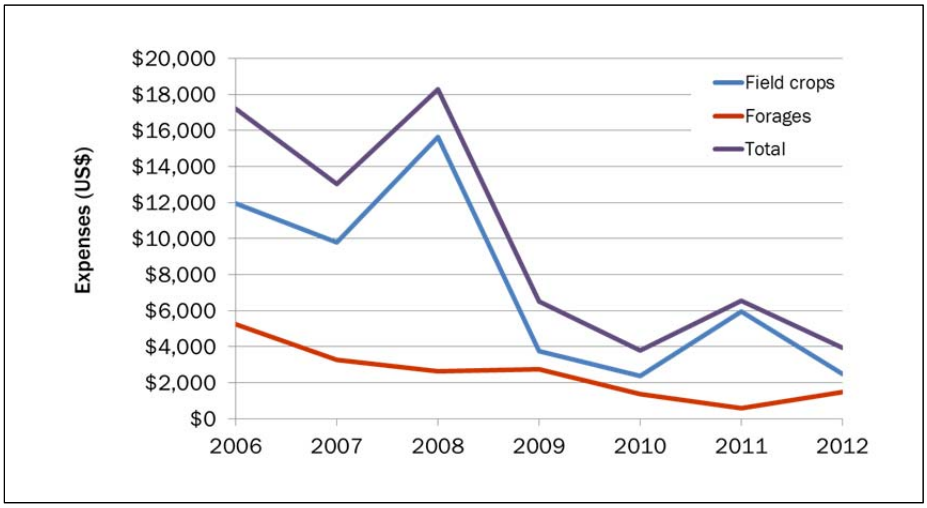
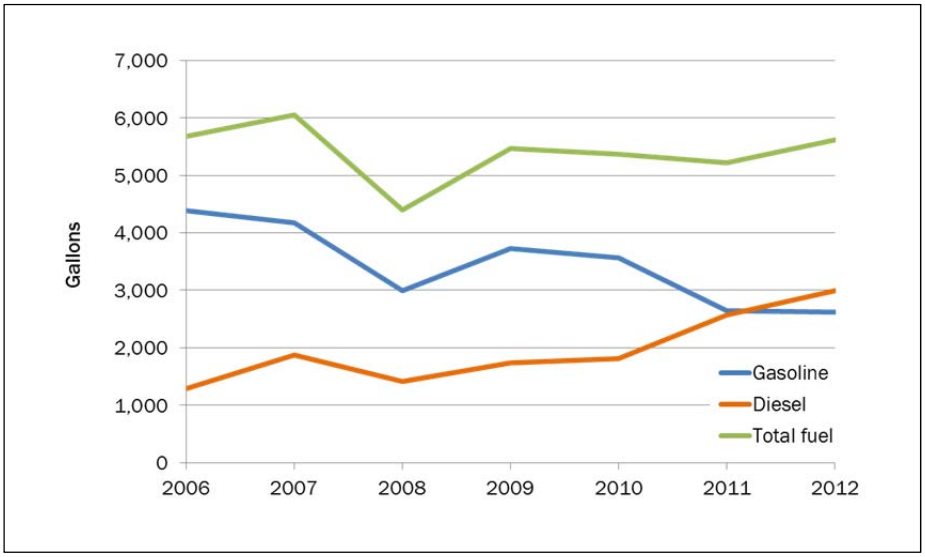


Figure 5. Fuel Use on the Berea College Student Farm, 2006–2012



Note: 1 gallon = 3.8 liters

Segregation of fuel consumption according to use was not possible because the farm's diesel tractors might be used for multiple tasks each day, such as soil preparation, planting, spraying, cultivating, mowing, harvesting, and transporting hay and livestock. In addition, the farm manager's truck, used by students for a variety of tasks, and the combine harvester operated on diesel. We expected a possible increase in diesel consumption with organic row-crop production as a result of more passes over the field for ground preparation and cultivation. In fact, diesel consumption on the farm did increase over the transition period (figure 5), and was largely accounted for by the greater use of tractors in the horticultural enterprise, replacing smaller gasoline-powered rototillers. Another important factor driving up diesel use was the more frequent use of the farm manager's truck for delivering livestock to the custom meat processor. Student travel in vans between campus and the farm, which accounted

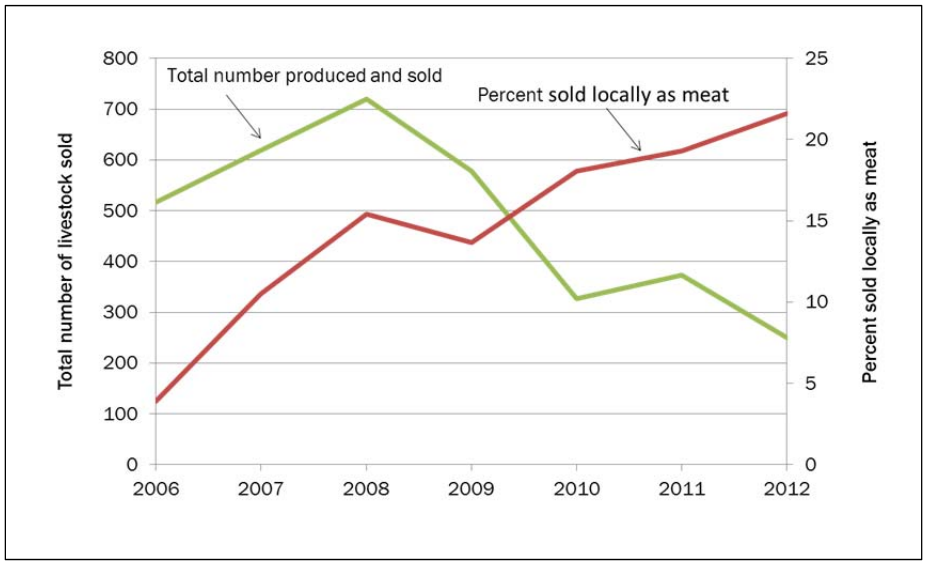
for a significant fraction of gasoline consumption, did not change. Overall, total fuel consumption remained steady, although use of gasoline declined and diesel increased during the transition (figure 5).

Transition to Low-Input Livestock Production

Changes to the livestock enterprises were aimed at addressing concerns about economic performance, environmental impact, and animal welfare. The farm's economic viability was highly dependent on the performance of the cattle and hog enterprises, which used 90 percent of the farm's land resources (table 2) and accounted for about 80 percent of the operating budget. And though these animal enterprises generated over 80 percent of the gross revenue for the farm, their dependence on purchased inputs, particularly feedstuffs, crop-fertilizers, and pharmaceuticals, as well as the generally low and unpredictable commodity prices they earned, made the entire farm financially vulnerable as these enterprises struggled to generate a positive cash flow at any given time. A valid and troubling question was raised: If the farm's livestock production systems were modeled on accepted conventional practices based on the most up-to-date technical information from universities and cooperative extension and yet the financial performance was marginal at best and likely unsustainable under real market conditions, what was the farm teaching students? While it might be argued that this was an economy-of-scale issue, the farm's newly defined mission was toward the small to medium-sized farms of the region. In this context the farm was really meeting neither of its goals for livestock production.

Specific concerns about the livestock enterprises prior to the farm's transition included the possible environmental and human-health effects associated with the continuous use of subtherapeutic antibiotics in the hog feed and the potential evolution of antibiotic resistance in pathogens (Anderson, Nelson, Rossiter, & Angulo, 2003; Kumar, Gupta, Chander, & Singh, 2005; Mathew, Beckmann, & Saxton, 2001; McEwen & Fedorka-Cray, 2002); the loss of nitrogen, an expensive input and environmental contaminant, from the hog-waste lagoons (Hatfield, Brumm, & Melvin, 1998; Osterberg & Wallinga, 2004); and unnecessarily feeding ruminant species (cattle, sheep, and goats) corn and other human-edible grains (Smil, 2002; Steinfeld, Gerber, Wassenaar, Castel, Rosales, & de Haan, 2006). Although these conditions represented those typically found in conventional agriculture, many in the group thought they also had negative consequences to the farm's workers, the surrounding community, and beyond. The concerns about animal welfare stemmed largely from the use of gestation crates and confinement (Honeyman, 2005), though they were not shared by all. And the infrastructural investment for an industrial hog production system was seen as beyond the reach of small to medium-sized farmers and therefore not relevant to the region.

Figure 6. Number of Livestock (Beef Cattle, Hogs, Sheep, and Goats) Produced and Sold and the Percent Sold Locally as Meat, 2006–2012



To begin to address the issues raised, two major changes in livestock production were planned and implemented on the farm beginning in 2008: (1) a side-by-side

feasibility comparison of hogs produced conventionally indoors to those produced outdoors; and (2) a phasing out of all grain-based feeds for the cattle, goats, and sheep. Both of these changes were expected to at least begin to address the environmental concerns and reduce the costs of production. And both were tied to a necessary gradual reduction in herd size for all livestock enterprises. Prior to these changes the farm had been producing and selling 500–700 head per year (400–500 hogs, 50–100 beef cattle, and 50–100 goats and sheep). By the end of the transition the number of livestock produced was reduced by 50 percent (figure 6). The sheep were phased out by 2009 due to frequent health problems (intestinal parasites and foot rot) and losses to coyotes. A small goat herd was retained through new genetics for better suitability to a forage-only diet and to address similar health problems. The Boer goat herd was therefore replaced with Spanish x Kiko crosses.

The hog-system comparison was intended to examine the possible negative consequences of outdoor production before committing to a complete transition. In particular, there was concern over piglet mortality, feed-use efficiency and costs, and risk to student workers from defensive sows. The trial, established in September and October 2008, included nine sows outside and 13 sows under indoor confinement. The sows outside were provided with simple hoop structures and deep straw bedding for shelter. A cohort of 240 pigs was tracked from birth to finishing beginning in spring 2009. Upon finding that mortality rates, weight gain, and feed-use efficiency were comparable and that protocols adequately addressed student-worker safety, concerns were allayed and the last farrowing in gestation crates took place in spring 2009.

The newly established outdoor system incorporated Yorkshire, Berkshire, and Large Black genetics with some Duroc and Tamworth. The sows farrowed twice per year — March/April and September/October — in metal hooped huts with deep bedding. Piglets were ear-notched for identification and the males were castrated but tails were left intact. The pigs were weaned at 7–9 weeks old and fed a ration produced from farm-grown conventional corn, purchased commercial soybean meal, and a vitamin/mineral premix with no animal byproducts. No subtherapeutic antibiotics were added. Fall-produced pigs were allowed to "hog down" standing corn crops and provided with a purchased protein/vitamin/mineral supplement. The spring-produced pigs were given access to forage such as clover, turnip, and fodder rape along with the corn-based, milled ration. Hog grazing was controlled with portable electric fencing to thoroughly utilize the forages but prevent excessive soil disturbance and erosion (figure 7). Finished

Figure 7. Hogs Produced Outside on the Berea College Student Farm Using Portable Electric Fencing for Controlling Grazing and Rooting and Provided with Deep-Bedded Hoop Shelters

hogs were marketed and sold through several value chains listed here from most to least profitable: (1) frozen meat cuts at the local farmers' market; (2) custom-processed whole animals for the college dining hall; (3) live, directly from the farm to customers for home processing; and (4) live to a local meat processing and distribution company specializing in humanely and naturally produced products. This last option was facilitated by the farm's pursuit of an animal welfare certification (Animal Welfare Approved, n.d.) that was made possible by the new outdoor production system. These market pathways provided flexibility so that higher-value markets could be satisfied first and the remainder would go to lower-value markets. All were better options than selling to a large corporate meatpacker or via a stockyard auction, both of which were discontinued in 2009 (table 3).

Phasing out corn from the diets of the cattle herd, composed of Angus and Angus crosses with Gelbvieh and Simmental, took place relatively quickly and easily. Efforts were already underway to use the farm's pastureland more efficiently with management-intensive rotational grazing. However a complete network of water delivery had to be in place and perimeter fencing needed to be repaired or built before this practice could fully replace the less intensively managed grazing that was used previously. Under the new management system cattle were rotated on mixed perennial pastures year-round and supplemented with hay as needed, particularly in winter. Grazing was managed intensively using portable electric fencing. The finished cattle were sold as (1) frozen retail meat cuts at the local farmers market; (2) custom-processed whole animals for the college dining hall; (3) live to the same local specialty meat processing and distribution company described above; or (4) at a stockyard auction (table 3). This range of marketing options provided needed flexibility for the enterprise.

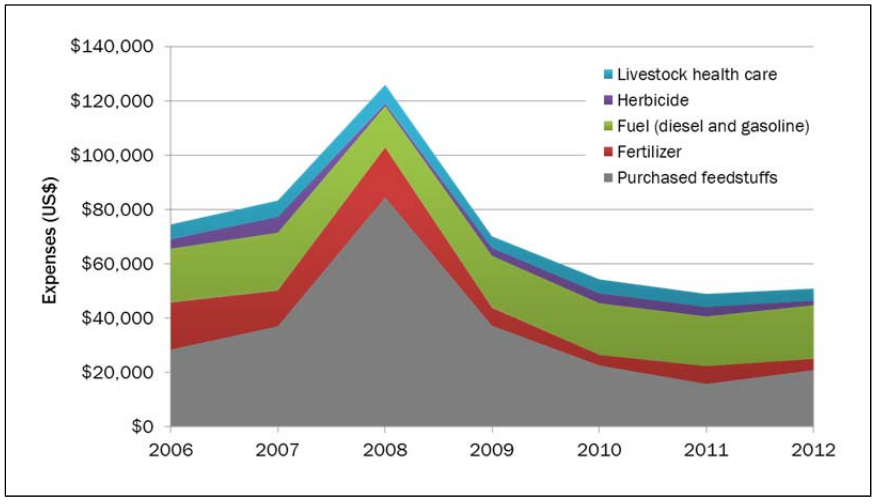
Table 3. Estimated Average Net Returns per Head (US$) for Hogs and Beef Cattle Sold in 2011–2012 Through Different Market Pathways

The return values are after accounting for production, processing, transportation, marketing, storage, and sales costs (including estimates of labor inputs). The first two represent pork and beef sales as frozen meat products while the other two pathways are sales of live animals.

Market pathway	Hogs	Cattle
Retail cuts sold direct to consumer at farmers' market	$350	$1,250
Custom-processed for college dining hall[a]	$75	$55
Live animals sold to specialty meat processor	–$50	–$75
Stockyard auction or large corporate meatpacker[b]	–$100	–$85

[a] For cattle this is mostly cull-cows sold as hamburgers.
[b] Estimated based on market prices since no hogs were sent through this pathway after 2010.

Figure 8. Expenses (US$) for Major Farm Inputs, 2006–2012



In 2008 purchased livestock feed required an expenditure equivalent to 44 percent of the farm's gross revenue (figure 8). By 2011 and 2012 purchased feed costs had decreased by over 75 percent, accounting for only 14 percent of the farm's input costs (table 4), and were equivalent to only 10 percent of the farm's gross revenue (figure 8). This substantial reduction in off-farm feed inputs was accomplished largely by reducing herd sizes to bring them in line with the farm's feed-crop production

capacity. Despite this, gross income was maintained during this time by generating more gross revenue per head through value-added market pathways (table 4). In 2006 only 4 percent of the animals were sold locally as meat, but by 2012 this figure had increased to 22 percent (figure 6). Most animals were still being sold at a loss, but when all costs were accounted for the increasing percentage sold as meat carried the livestock enterprises financially.

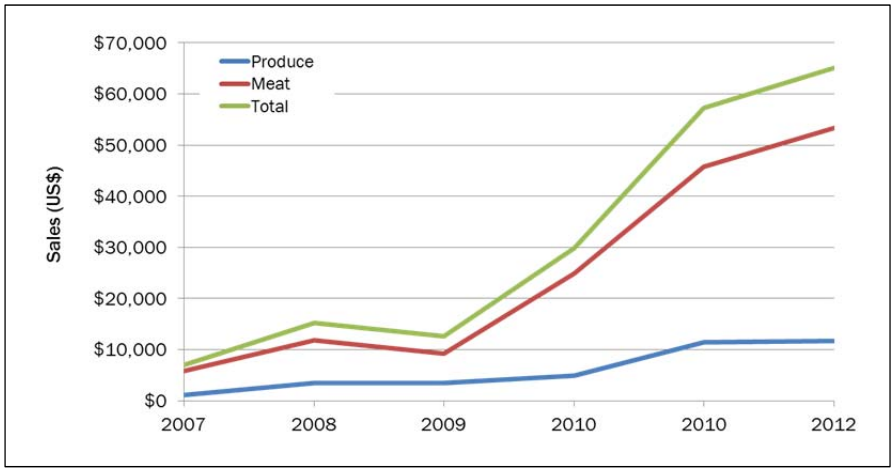
Total livestock costs declined only slightly during the transition period despite moderate to substantial reductions in herd size (figure 6), purchased feed expenditures (figure 7), and to a lesser extent, health-care costs, because of the additional costs for processing, transporting, storing, marketing, and selling more meat. But these additional costs were a necessary investment to capture more of the potential value per animal produced and sold.

Localization of Marketing and Sales

The farm's transition to organic crop and low-input livestock production may not have succeeded had it not been for new local and regional markets that emerged concurrently. Prior to the transition, sales of certified organic fresh produce had steadily increased but still accounted for less than 15 percent of the farm's total gross revenue, which was still generated largely through sales of conventionally produced livestock. As the farm took on a more active and year-round role at the local farmers market, its sales of produce, and to a lesser extent meat, continued to rise. But by 2009, farmers-market sales leveled off and even began to decline. The farm had a loyal customer base that valued the products, but there were also some town-gown tensions as some producers blamed the student farm's success for decreases in their sales. Some customers began to avoid the student farm as a result. In actuality these slumping sales coincided with the start of the Great Recession of 2008–2009, and sales for all producers, including the student farm, were suffering. Fortunately, other markets opened up.

After several years of dialogue and negotiations with the college's food service contractor, Sodexo, Inc., the farm began to sell a modest amount of meat and produce to the dining hall for student consumption in 2006. It had been several decades since any food from the student farm had been purchased by the dining hall. This new interest in buying a limited amount of the farm's products was partly an effort by Sodexo to appease the college administration and ensure contract renewal, but it was also a test of the farm's capacity to supply products reliably, consistently, and economically on a much larger scale than it had been recently accustomed. (Berea College has about 1,600 students, with 80 percent of them eating in the dining hall.) During a three-year trial period (2006–09) the farm adjusted its production schedules to better suit the dining hall's demand and improve the farm's organization, efficiency, and communication with the dining hall. The dining hall's staff also became more accustomed to handling seasonal variations in product availability. A solid and trusting relationship between parties developed and a sharp increase in purchases began in 2010 (figure 9). This new outlet for the farm's products helped counter the stagnating farmers-market sales, particularly for meat. And though the net margins (including estimated labor costs) on custom-processed livestock for the dining hall were

Figure 9. Student Farm Sales (US$) to the College Dining Hall, 2007–2012



not nearly as high as those sold at the farmers market, they were much better than those sold live (table 3).

Another marketing and sales option emerged in 2010 with the opening of Marksbury Farm Market less than 30 miles (48 km) from Berea, a specialty meat processing and marketing company with a stated commitment to buying livestock only from local farmers using "sustainable, humane and natural production methods." The company paid a small premium over commodity prices and offered custom processing services much closer to the farm than other USDA-inspected processors. With certification from Animal Welfare Approved established for cattle in 2010 and for hogs in 2011, the farm finally had an alternative to the conventional commodity markets and auctions. However, although this provided a better option it was still only an outlet for surplus animals after the preferred retail and custom meat markets, as it was still not profitable (table 3).

The net effect of this combination of interrelated changes on the farm's overall financial performance was positive and substantial. Over the six-year period from 2007 to 2012 the annual net cash flow improved by over US$50,000 (figure 10). This was accomplished largely by expanding organic crop production, reducing livestock herd sizes and their associated costs, focusing on the efficient use of appropriate feeds produced on-farm rather than purchased feedstuffs (figure 11), adding value through processing and adopting production practices that permitted third-party certifications, and finding new markets, which typically offered higher prices.

The initiatives had a synergistic effect in buffering the farm financially when some individual enterprises suffered losses due to mistakes, miscalculations, or unanticipated events (like flooded fields, drought, and changing markets) or when expensive investments were required. The horticulture enterprise actually carried the farm financially during the early years of the transitional period (2008–09). It

Figure 10. Farm Annual Net Cash Flow (US$), 2007–2012

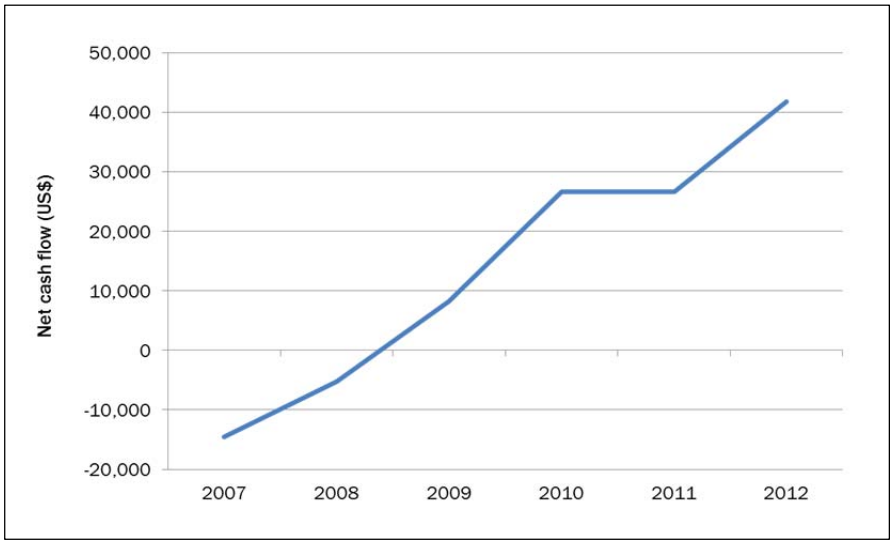
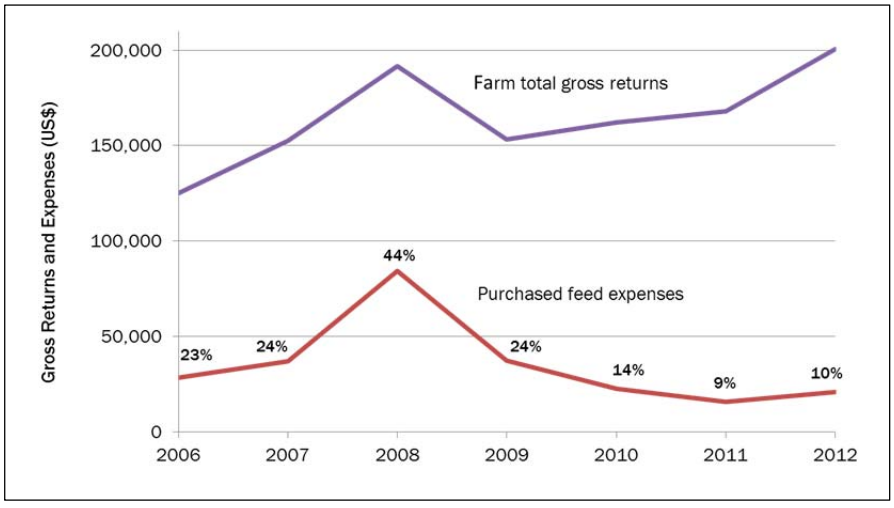


Figure 11. Farm Gross Income and Expenditures (US$) for Purchased Feed in Dollars and as a Percentage of Annual Gross Income, 2006–2012



increased output using season-extension techniques to produce nearly year-round, expanded the range of products offered to include human-edible grains and pulses, and improved yields and quality to cover the losses of the livestock enterprises. During the transition period the horticulture enterprise expanded its footprint from just over 1 percent to nearly 3 percent of the available farmland as the livestock land requirements declined. Herd-size reductions for all three livestock enterprises and the elimination of corn from the rations of the ruminants reduced the need for field corn, both farm-produced and purchased. This allowed the farm to put most of the transitional land into forages to build soil fertility, manage weeds, and minimize the risks of producing corn organically prior to certification.

Likewise, the changes to the hog and cattle operations not only reduced pressure on the farm's field-crop operation, but also created the opportunity for an animal welfare certification that granted access to alternative markets. The shift toward direct marketing of meat instead of live animals and the new specialty market for live animals helped to maintain a nearly stable income stream even as herd sizes were reduced. Some of the savings from reduced feed purchases and animal health-care expenses were tempered by new processing and transportation costs as more livestock were processed into meat, marketed, stored, and eventually sold. But this investment made it possible to generate nearly as much gross income with only 250 animals as was previously made selling 700 head, mostly as live animals.

Lessons Learned

This case study demonstrates the high degree of interdependence among these three initiatives aimed at improving the farm's sustainability (table 1). Though each initiative contributed to reducing the farm's reliance on off-farm inputs and improving its overall financial performance, the implementation of each was dependent on the other two occurring simultaneously. The total amount of farmland used and labor invested remained steady while the allocation of land and labor to each enterprise changed to accommodate to new practices. The transition to organic crop production resulted in an expected reduction in agrochemical use and expenses, higher prices for crop products in the market, and an improvement to the financial performance of the whole-farm system. The implementation of the new organic crop rotation required that the acreage devoted to corn each year be reduced and partially replaced with forages, which are easier to grow without fertilizers and herbicides and which improve soil quality. Decreasing the livestock herd sizes and transitioning the cattle from grain- to grass-finishing reduced the farm's need for corn. With fewer animals being produced, the farm had to seek ways to generate more revenue per animal and did so by selling more meat to local markets and fewer live animals through less lucrative commodity markets. Fewer livestock also allowed for an expansion of acreage used for certified organic horticultural and field crops, which generated greater returns per acre than hogs or cattle.

Gross revenue per acre from horticultural production, which was entirely under organic management during the five-year period, was five times greater than that of the hogs and 20 times greater than for ruminants (table 2). If land is considered the most limiting resource of the farm, as it often is on small farms, using it for horticulture makes sense financially. Horticultural products were only sold locally and there are advantages to the shorter product value chains for the farm, local wholesale buyers, and consumers. Less time between harvest and consumption should result in less waste and fresher products, which are not only more nutritious but also more appealing to eat (Kader, 2008; Rickman, Barrett, & Bruhn, 2007).

Remaining Questions

Consistent information is lacking on the relative environmental costs of different types of meat production systems. It is well established that most meats, and especially beef, require greater inputs of natural resources and generate more polluting emissions per unit of caloric energy and protein than plant-based foods (Hamerschlag, 2011; Pimentel & Pimentel, 2007; Smil, 2002). There is less agreement, however, on the relative pros and cons of different livestock production systems. Some researchers have reported a variety of envi-

ronmental benefits from low-input and organic livestock production systems over their conventional counterparts (Casey & Holden, 2006; Haas, Wetterich, & Köpke, 2001). These include reductions in energy consumption per acre, energy use per unit of product, greenhouse gas emissions, and potential water and air pollution. But recent life-cycle assessments for beef (Pelletier, Pirog, & Rasmussen, 2010) and pork (Pelletier, Lammers, Stender, & Pirog, 2010) in the north-central U.S. suggest that grass-based and organic livestock production systems have no advantages or may even be worse than conventional systems in energy use, greenhouse gas emissions, eutrophication potential, and ecological footprint. In particular, Pelletier, Pirog and Rasmussen report that slower growth rates for cattle on pasture extend the production period and consequently result in more methane production. For hogs raised outside, lower feed efficiencies and fewer piglets produced per sow were assumed, resulting in lower efficiency rates and an inferior environmental performance relative to confinement hogs.

Gurian-Sherman (2011), as well as Pelletier and colleagues, caution against broad generalizations from life-cycle assessments like these due to the assumed values for production rates, conversion efficiencies, pollution emissions, and carbon sequestration rates — all of which can fall within wide potential ranges. Variations in local and regional conditions, including land and soil characteristics, climate, and pasture composition and productivity may have important effects on calculated outcomes. Further, there may be relevant management differences within a given type of production system. For example, outdoor hog production on the Berea College student farm included moving the hog herd through standing cornfields in a controlled manner using portable electric fencing. This eliminated a number of steps that were previously part of the conventional indoor confinement system, including combine harvesting, drying, milling, and transporting corn, as well as pumping the waste lagoons to adjacent pastures. The absence of these activities in the alternative system reduced production costs and likely reduced energy use and the pollution potential relative to the former confinement system.

While there is still much to learn about the environmental trade-offs of alternative livestock systems, there is somewhat more agreement on the environmental trade-offs of organic and conventional crop production. Gomiero et al. (2011) conducted a thorough literature review comparing organic and conventional cropping systems and reported that organic systems offer numerous advantages with respect to soil quality, protection of water and biodiversity, and efficient use of nonrenewable resources. But lower crop productivity per acre is typical in organic systems, particularly for crops with high nitrogen demands, like corn. Lynch, MacRae, & Martin (2011) also conducted a comprehensive literature review and concluded that there was strong evidence favoring organic over conventional crop production for reducing nonrenewable energy inputs and improving energy efficiency per acre and per unit of product. But the literature was less definitive about greenhouse gas emissions. Similarly, Venkat (2012) used life-cycle assessments to compare greenhouse gas emissions for 12 crops produced organically and conventionally in California and found that in some cases organic performed better and in others conventional production was superior, largely due to higher conventional yields.

Future considerations for the Berea College student farm should weigh the benefits of continued expansion of organic annual horticultural crops against the risks of annually disturbing the farm's vulnerable low-quality land, with its rolling topography, shallow soils, and poor drainage. The most productive and environmentally sound use for most of this land, at least when considering soil and water quality, may be grass-based cattle production. Improved understanding of the environmental and/or community-health impacts of the farm's enterprises will undoubtedly be taken into account, but market demand will drive future decision-making because farm financial viability is necessary before externalities, like off-farm environmental degradation, can be addressed.

Conclusions

The goals of the three interdependent initiatives were to address observed or deduced deficiencies that compromised the sustainability of the farm,

particularly in the areas of environmental stewardship, economic viability and stability, and livestock welfare (table 1). The students, staff, and faculty involved brought different perspectives, expertise and concerns to the conversation, but all were motivated to improve the college's primary experiential laboratory for teaching and learning agriculture. All of the stakeholders who helped develop and implement the initiatives were guided by the two overarching goals for the farm — practical educational laboratory and model of sustainability — and informed by current scientific literature as well as actual farm experiences. The three initiatives could be viewed as conceptually simple, but the practical implementation required many changes to daily, routine activities that were collectively challenging and risky because of possible unknowns from within (e.g., poor crop production, livestock illness, and technological or management failures) and outside (e.g., extreme weather events, changes in market demand and prices) of the farm. Any changes made to one enterprise on this diversified farm inevitably affected other parts of the farm, a reality that is often not addressed in small-scale, controlled, replicated plot studies.

The measurable outcomes according to the partial-budget analysis and use of purchased inputs, like feedstuffs and synthetic fertilizers, indicate that improvements were achieved in the farm's operations. But environmental outcomes, which are still largely externalities, could not be directly measured. Instead, we must make inferences from the literature. It is clear that the posttransition farm used fewer nonrenewable material inputs in crop production, like fertilizers and herbicides, but some questions remain about the net effects of the livestock initiative, particularly regarding greenhouse-gas emissions. The livestock initiative was also aimed at improving animal welfare — including maintaining good animal health, preventing suffering, and accommodating natural behaviors — and this outcome is problematic to document or quantify. The posttransition farm sold more products locally and, by adding value through processing (mainly by converting livestock into meat), was able to generate the same or greater gross revenue with fewer animals and lower material costs. As a result of the new crop and livestock management practices the farm gained access to new markets, which often offered premiums for third-party certifications (USDA certified organic and Animal Welfare Approved). As reliable information becomes available and consensus builds in the agriculture community, externalities should be factored into the analysis to more thoroughly understand the broader economic, environmental and social costs and benefits of this transition.

Acknowledgements

The author acknowledges the contributions and teamwork of the entire farm advisory board during the study period, including past and present members who played critical roles during the farm's transition period. This includes Bob Harned, Jamie Rowse, Matt Wilson, Derek Law, Andrew Oles, Janet Meyer, Jessa Turner, and Michael Panciera. Thanks also to the many dozens of students who were essential in the running the farm each day and without whom there would be no farm.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Is organic agriculture a viable strategy in contexts of rapid agrarian transition? Evidence from Cambodia

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Submitted July 1, 2013 / Revised August 21, 2013, and November 15, 2013 / Accepted November 18, 2013 / Published online February 24, 2014

Citation: Beban, A. (2014). Is organic agriculture a viable strategy in contexts of rapid agrarian transition? Evidence from Cambodia. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 131–147.
http://dx.doi.org/10.5304/jafscd.2014.042.004

Abstract

This paper draws on evidence from a field study of three organic agriculture development projects in Cambodia to look critically at the pursuit of organic agriculture as a rural development strategy in a context of rapid agrarian transition. I find that organic agriculture is a successful strategy for some households to improve the viability of land-based livelihoods as part of broader livelihood strategies, particularly within projects most closely aligned with an agroecological understanding valuing diversity and farmer knowledge. However, there are inherent contradictions in prescribing northern, market driven notions of farming success into the very different cultural and ecological settings of the Global South, and certification requirements, resource constraints and labor requirements can exclude some farmers. I argue that analysis of organic-farming as a rural development strategy needs to understand not just the direct economic returns, for the non-economic aspects, the broader socio-political contexts of uneven agrarian transition, and the ideology and practices of development agencies have a large bearing on the poverty reduction potential of organic farming.

Keywords

agrarian transition, Cambodia, Global South, international development, livelihoods, organic agriculture

Introduction

Cambodia, like many countries in the Global South, is undergoing a rapid agrarian transition as processes of rural and urban change make farming-based livelihoods less viable and off-farm options more accessible. A resurgent literature on processes of agrarian transformation in Southeast Asia seeks to understand these changes, drawing on classic questions on the fate of the peasantry in capitalism (Kautsky, 1899; Lenin, 1956) while recognizing the complexity of livelihood diversification, state and civil society roles, and new international and urban interests in land (for a review see Akram-Lodhi and Kay, 2010a and 2010b). Rural land-based liveli-

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hoods in Southeast Asia are increasingly perceived as more risky than urban migration and wage work, and wealth may not map so neatly onto land ownership as in the past (Rigg, 2006; 2012). In this uncertain context, a key question in rural development is whether pathways out of agriculture may therefore constitute the best form of poverty reduction for the rural poor (Li, 2009; Rigg, 2006; Thavat, 2011; World Bank, Public Information Center, 2006).

In this paper I provide one perspective on this question by considering the promotion of organic agriculture as a development strategy for smallholders in Cambodia. This inquiry is inspired by a growing collection of research — including pleas in the popular press for shoppers to "stop obsessing about your arugula…[It] is no recipe for saving the world's millions" (Paarlberg, 2010, para. 1) — that raises the question of whether organic agriculture may *entrench* poverty rather than increasing well-being if it requires more labor with uncertain income benefits (Barham & Callenes, 2011; Paarlberg, 2010; Taotawin, 2010; Thavat, 2011). This argument suggests that rural people may be better off selling their land and moving to urban areas for wage work, or pursuing modern labor-saving agriculture and freeing up labor for wage labor and other rural nonfarm employment opportunities (Rigg, 2006; Thavat, 2011). I seek to deepen this debate, using research on three organic agriculture development projects in Cambodia to make two related arguments: First, the broader, usually implicit, frame of this debate is the larger structural context of agrarian transition, and explicit research attention needs to move beyond the economics of the farm unit to the uneven, contingent agrarian transitions in which farmers make constrained choices involving multiple rural-urban livelihoods. Second, there is a need to move away from concepts of "organic" as morally superior or overtly negative, to appreciate the heterogeneity of organic agriculture development initiatives and the diversity of outcomes for different groups. Organic agriculture in Cambodia, as in much of the Global South, is promoted primarily as a rural development strategy for poverty reduction through nongovernmental organizations (NGOs) and donor agencies. The range of organic initiatives in Cambodia reflects the ideologies of the development agencies and their understandings of how the agrarian question in Cambodia is best resolved, and these initiatives shape (and are shaped by) farmers' access to resources and ability to benefit from organic farming. Overall, my analysis shows that participation in organic farming development projects is a successful strategy for *some* households, but it is not a panacea for rural poverty in Cambodia. Direct economic benefits are uncertain; non-economic benefits, broader contexts of uneven agrarian transition, and development agency approaches have a large bearing on the poverty reduction potential of organics. I structure this paper in two broad sections: I outline the literature on organic agriculture in the Global South and explain Cambodia's agrarian transition; I then use my empirical research to draw out four themes that can broaden the debate on the potential for organics in the Global South.

Organic Agriculture: Poverty Alleviation or Poverty Trap?

Organic agriculture development projects in the Global South have proliferated since the late 1990s, and a growing body of research globally supports the notion that organic agriculture can enhance smallholder households' food security, whether or not they sell any of their harvest (Araya & Edwards, 2004; Badgley et al., 2007; Parrott, Olesen, & Høgh-Jensen, 2006). Farmers' incomes may increase through premium prices (Scialabba & Hattam, 2002) and/or increased productivity (International Assessment of Agricultural Knowledge, Science and Technology for Development [IAASTD], 2008; Pretty et al., 2006), and organics may improve producer health, "cool" the planet, produce food more efficiently than large farms, and diversify growing systems (IAASTD, 2008). Although critical research on alternative food networks in the Global South has focused largely on fair trade (Bacon, 2005) and most critical theorizing of organics is developed from North American and European experiences (Allen & Kovach, 2000; Guthman, 2004), an expanding research agenda examines smallholder organic agriculture in the Global South. Research in Latin

America shows that expectations of organic price premiums benefiting farmers may be problematic, as price premiums from organic and fair trade certification are small, and migration remittances and yield increases (for farmers in programs with a technical training component) may have a greater effect on household income (Barham & Callenes, 2011; Ruben & Fort, 2012). Beuchelt and Zeller's (2011) survey of organic, fair trade, and conventional coffee producers in Nicaragua found that premium farm-gate prices for organic coffee did not translate into higher profit, due to increased labor costs. Organic producers were poorer relative to conventional producers throughout the 10-year study period. The organic producers had smaller farm sizes and larger family sizes, and the authors suggest that the higher labor requirements may limit the impacts on poverty alleviation. A central tension in certified organic farming is the simultaneous delinking from market-based chemical inputs in favor of knowledge-intensive techniques, and the deeper integration into distant markets, which may increase farmer vulnerability to global price fluctuations. This long-term perspective illuminates the possibility of "premium squeeze" as the entry of new farmers into an expanding organics market can lower farm-gate prices for producers, similar to the processes of "conventionalization" identified in North American and European organic sectors (Guthman, 2004). In Cambodia, Thavat (2011) finds that for "de facto" organic farmers (i.e., "traditional" farmers who do not use agricultural chemicals and gain organic certification on the basis of their existing farming system), labor requirements increased while price premiums were minimal, and the increased labor requirements could potentially keep households from accessing off-farm opportunities. Thavat concludes that organic agriculture development projects amongst de facto farmers "seems an absurd way to go about promoting "development" — paying paltry premiums to marginally increase the viability of precarious livelihoods" (p. 296). I build on Thavat's (2011) work in Cambodia by looking not only at de facto organic farmers but rather at a diversity of approaches and farming systems, which shows that organics can both promote and impede poverty reduction. Thavat (2011) and other studies successfully draw attention to economic processes beyond farm-gate price premiums, including possible increases in labor requirements (including intensification of gendered unpaid family labor), and the recognition of opportunity costs whereby going organic may limit household ability to devote labor to migration or other income-earning opportunities. Barham and Callenes (2011) also look beyond the farm gate in their study of the importance of organic coffee production in the broader livelihood activities of Nicaraguan smallholders, and find that while organic production has increased, this is a much smaller percentage of household income than migration remittances from the United States. This underlines the importance of understanding the household farm as just one aspect of rural people's daily life, a perspective well articulated in the sustainable livelihoods approach that recognizes rural people's diverse occupations, and the increased fluidity of rural/urban livelihoods (Scoones, 2009).

Attention to rural livelihoods in agrarian transition needs to be combined with critical development theory, which recognizes the central role of the development organization in promoting organics. Organic agriculture has been promoted and financed in Global South contexts such as Cambodia through development agencies and NGOs as a development intervention, in contrast to its spread in the Global North largely through farmer-to-farmer adoption with market incentives and some government support (Vandergeest, 2011). Organic sectors in the Global South are still part of the broader global food system, and geared largely toward supplying food for niche-market consumers in the Global North and Southern urban elites, but historical contexts of colonialism and ongoing inequality in trade and global power relations are central to the experience in the South (Friedberg & Goldstein, 2011). Gaps between farmer needs and desires and the mandates of development agencies, as well as divergent understandings of the value of farming as a livelihood, can shape the experiences of farmers in organic projects (Friedberg & Goldstein, 2011;Li, 2007). The development sector is particularly influential in Cambodia, as the donor agencies and NGOs that proliferated in the post-

conflict period have moved into many areas of rural development, and donor agency and NGO attitudes toward agrarian transition — what are the problems and changes in rural Cambodia, and what does a viable agriculture sector and broader rural livelihoods look like? — shape the projects they design. In Cambodia, these projects range from interventions which focus on farmers' limited global market opportunities, and therefore promote export-focused organic rice as a niche product for the European and American markets, to interventions which focus on ill health and debt as barriers to well-being, and therefore promote reduced chemical use and training in alternative methods of soil enrichment to reduce input dependence. Given that agrarian transformations and the ways these are understood by development agencies and farmers have a large impact on farmer experiences of organic agriculture, I now sketch out the national and global shifts that are transforming rural life in Cambodia.

Background: Changing Rural Livelihoods in Cambodia

A quarter century ago, Terence Byres (1986) argued that even the "classic" cases of agrarian transition to capitalism in Europe were diverse, and the resurgent literature on processes of agrarian transition in Southeast Asia shows that agrarian transformations are not natural, linear, or inevitable; rather, they are compelled by specific, complex forces (Hall, Hirsch, Li, 2011; Hart, Turton, & White, 1989; Rigg, 2012). I do not use the term "transition" here to imply a tautology of movement through prescribed stages from an imagined starting point of a homogenous farming community (Bernstein, 1996), for rural Cambodians have long survived through multiple livelihood strategies, and plantation agriculture has roots in colonial rubber plantations. Shifting state policies alternately promoting smallholder land dispossession and periods of land reform mean movements away from the land and movements back to peasant agriculture both occur. However, the development of factor markets for land, capital and labor in the postwar period of neoliberal restructuring, the state support for large-scale agribusiness, and rapid increases in population, landlessness, and labor migration (table 1) signal a radically new landscape for rural Cambodians to negotiate.

Some key features of Cambodia's current agrarian transformation reflected in table 1 include:

- Demographic pressure and fragmentation of farms, with rapid population increase contributing to shrinking land holdings, particularly in populous areas around the Tonle Sap lake and coastal zones;
- Urbanization such that the proportion of people working in agriculture and agriculture's share of GDP has significantly decreased, even as the total population in agriculture has increased due to population growth;
- Land grabbing and concentration of land ownership, including the expansion of

Table 1. Cambodia Total Population, Agricultural Population, Landlessness, and Remittances

	1980 (unless stated)	2005 (unless stated)
Total population (millions) [a]	6.8	13.9
Agricultural population (millions) [a]	5.1	9.4
Agricultural population (% total population) [a]	76	68
Agriculture (% GDP) [b]	47 (1993)	33
Land granted to agribusiness concessions (Ha) [c]	2,400 (1995)	2,106,345 (2013)
Landlessness (% total population) [d]	14 (1997)	28 (2009)
International migration remittances to Cambodia (USD million) [e]	12 (1996)	325 (2008)

Notes: [a] Food and Agriculture Organization of the United Nations Statistics [FAOSTAT] (2013); [b] World Bank (2013); [c] Cambodian League for the Promotion and Defense of Human Rights [LICADHO] (n.d.); [d] National Institute of Statistics [NIS] (1997; 2010a); [e] Kimsun (2011)

large-scale agribusiness leases called "economic land concessions" (ELCs) for corporate agriculture and ongoing market-based land accumulation, which contributes to increased concentration of land holdings and growing landlessness (Löhr, 2011; National Institute of Statistics [NIS], 2010b). Land concessions that benefit rural areas by increasing wage labor opportunities, even if they simultaneously limit land access for smallholders, although many of the concessions are used for speculation purposes and current research suggests employment is limited (Üllenberg, 2009);

- Legacies of conflict, including colonialism, civil war, forced collectivization, genocide, and the violence that continued until the late 1990s (Chandler, 2008; Heder, 1995), which leave their mark in widespread rural poverty, low use of both chemical fertilizers and traditional soil-enhancing techniques, and environmental degradation, due to resource accumulation by powerful military and political elite;
- A neoliberal capitalist agenda that since the 1990s has been promoted by international aid agencies and the ruling elite (Springer, 2009a; 2009b) and contributes to urban-focused growth, rising land markets, and inequality (Üllenberg, 2009);
- Migrant remittances as an increasingly important income source; this may be invested in agriculture, but households in areas with established migration routes may prioritize migration and lack household labor for farming;
- The feminization and aging of the farm population is increasing as more young people migrate, and women-headed and elderly households become more common; and
- Farming's perception as "risky," due in large part to severe flooding and droughts that farmers perceive to be worsening, as well as commodity and land price fluctuations and exploitation by powerful interests.

The spatial diversity and social unevenness of these processes of transition has implications for the viability of organic farming as a poverty reduction strategy. Farmers in areas accessible to urban labor markets may experience labor shortages and limited access to land, and farmers in areas with economic land concessions may be reluctant to take up organics if they feel their tenure is insecure, and development agencies and NGOs may avoid contested areas (and indeed, largely fail to address the broader political "land question") given the potential for them to lose the favor of the ruling party if they are too vocal over politically sensitive issues.

Research Methodology

This research is based on qualitative semistructured research with members of organic farming development initiatives in Cambodia run by three different organizations: the German Organization for Technical Cooperation (GTZ) in Kampong Thom Province; the Community Cooperative for Rural Development (CCRD) in Pursat Province; and the Cambodian Center for Study and Development in Agriculture (CEDAC) NGO in Takeo and Prey Veng provinces. I held semistructured interviews of between one and four hours with 57 farmers, ran seven farmer focus groups, and held interviews with development agency staff and local government extension personnel. I held interviews in farmers' homes and asked about people's experiences in the organic programs and their broader livelihood activities. In most cases I concluded interviews with a walk around participants' rice fields. During focus groups, I adapted Mayers and Vermeulen's (2005) model of power mapping, whereby farmers constructed spider diagrams of ranked issues and actors that impacted their organics group, to understand the challenges farmers faced. I used these qualitative methods in order to understand farmers' own perceptions of their experiences with organic farming and how these meshed with their broader aspirations and multiple livelihoods. I did not include a comparative group of conventional farmers. The study therefore is not intended to be representative of organic farmers beyond these groups; rather I use thematic analysis to bring out commonalities and

diversity within farmer experiences. The case study communities were chosen in order to cover three main criteria: a wide geographical area with diverse farming conditions and infrastructure; a variety of development organizations supporting the initiatives; and a variety of quality-control approaches (including export and domestic certified and noncertified systems) and trading approaches (including export, urban, local trade, and subsistence). The interviews were conducted in Khmer, either by me or with the aid of my research assistant (a university student in agricultural economics). Local staff of the organic initiatives helped with contacting potential research participants but were not present during interviews. My position as a white foreign woman conducting research with members of development projects presented ethical challenges, including the potential for people to see me as aligned with the organization and to answer questions strategically in the hope of gaining access to agency resources, as well as my need to maintain good relations with the organizations while also exploring the views of farmers beyond the "model" farmers that the organizations usually took me to meet. I attempted to overcome these constraints by emphasizing (both to farmers and organizations) that I was an independent researcher and the results would be kept confidential. Where possible, all members of a village organic group were interviewed, either one-on-one or as part of a focus group. In order to understand how social stratification related to people's experiences of organic agriculture, I attempted to include an equal number of female and male farmers and farmers of various wealth levels.

This research was undertaken in 2007, with follow-up interviews with development agency staff in 2012. The gap of several years since the initial research allows me to incorporate sectoral changes since the study; also, the year 2007 is particularly instructive for a discussion of organics in Cambodia as this period was concurrently one of a shift away from agriculture-based livelihoods and a rapid growth in organic agriculture development programs. I identified more than 30 NGOs and development agencies promoting some kind of organic agriculture or sustainable agriculture program in 2007 (including both domestic and export certified systems, and noncertified systems). The establishment of the Cambodia Organic Agriculture Association (COrAA) in 2006 lent legitimacy to the sector within some areas of the government.

Organic Agriculture Development Programs in Cambodia: Three Case Studies

Cambodian rice production is seen by development institutions and some parts of the government as a prime prospect for organic agriculture, and the organics sector is heavily donor-driven (COrAA, 2011). Donors point to the combination of fertile land and the plentiful water supply from the Tonle Sap, and the fact that although synthetic chemicals are becoming more widespread in rice production, many farmers still farm without using chemicals (Feuer, 2007). Donors see organics as potentially reducing poverty in a challenging context where farmers generally achieve much lower yields than neighboring countries (in part due to underinvestment in agriculture and lack of irrigation and infrastructural development, high electricity costs, and limited access to and control over land) and often face high debt and vulnerability to weather and market events. Rice production is a priority sector for Cambodia; production increased at 7.4 percent annually from 2000 to 2010 (Food and Agriculture Organization of the United Nations [FAO], 2013). The Cambodian government has a contradictory stance toward organic production: On one hand, the government supports the development of organic smallholder production for self-consumption and export to become the "green farm" of Asia, and is part of the new ASEAN regional organic guidelines currently under discussion[1]; but since the food crisis in 2008, attention has shifted to boosting conventional exports and gaining revenue through large scale land concessions (COrAA, 2011). The COrAA (2011) estimates that the organic sector is small but growing, with around 8,500 farmers cultivating rice organically as part of organic producer groups, and

[1] The Association of Southeast Asian Nations (ASEAN) Standard for Organic Agriculture (ASOA) is due to be finalized in 2014. It is designed to cover all agricultural croperatives. See http://unfss.files.wordpress.com/2013/04/organic_unfss.pdf

more than 110,000 farmers implementing some organic techniques. Before discussing the specific benefits and limitations of organic agriculture in this context, I first outline each of the three case studies. I do not suggest that any one of these cases constitutes a model success story; rather I present all three cases in order to show the heterogeneity within organic agriculture projects and the central role of the development organization in structuring the potential for the projects to either reduce or entrench poverty.

German Federal Development Agency (GTZ) Rural Development Program

The German federal development agency (GTZ, now GIZ) was the major player developing the export organic rice market at the time of research through its Rural Development Program (RDP), with projects involving 700 farmers in two provinces (Kampong Thom and Kampot). The GTZ initiative aimed to create an organic supply chain for organic rice farmers producing for the export market. The first farmers in Kampong Thom became export-certified in 2006. However, GTZ did not manage to establish regular exports during the project time frame (five years) and the project was eventually discontinued. The inability to export was seen by one project staff member I interviewed to be due primarily to corruption within the rice supply chain in Cambodia, a lack of private-sector actors willing to be involved, poor infrastructure, and farmers not honoring contracts. During the project time frame, most of the organic rice produced was marketed through local channels and through a brand ("Saravan") that was sold at markets in Siem Reap and Phnom Penh and gained farmers a 10-percent premium price above local prices for conventional rice.

The GTZ strategy was to create a private-sector value chain for organic rice, which would connect farmers to high-value niche markets in the Global North. This strategy was framed as poverty reduction through trade, with "a more diversified and market-oriented form of agricultural small-scale production together with the development of the agro-industry as the best way out of poverty for Cambodia" (Schmerler, 2006, p. 1). GTZ aimed to develop a functioning private sector and build the capacity of local government and local NGOs, focusing on building horizontal networks (organizing farmers in groups) and vertical networks (linking farmers to wholesalers, retailers, and consumers) (Schmerler, 2006).

Community Cooperative for Rural Development (CCRD)

CCRD is a Cambodian NGO involved in postconflict reconstruction in Pursat province, which moved into organic rice (with funding from Oxfam Quebec) to increase farmer incomes through the sale of certified organic rice to North America and Europe. The NGO originally promoted organic rice as a way to increase incomes through price premiums to the farmers they were already working with, who were mainly conventional farmers. CCRD provided rice seed on credit, and farmers were promised premiums of 5 percent for the first year of organic conversion, and up to 20 percent for fully converted organic systems. However, at the time of my research, CCRD had ceased promoting organic rice cultivation to most of these farmers, as the farmers had experienced difficulties converting their farming systems to fully organic (in line with European Union and U.S. requirements).

The CCRD director told me that "after trying to convert farmers who used chemicals and finding it too hard to convert most, we decided to focus on families who were not using chemicals — farmers near the mountains where chemicals had not reached, because they are already organic." CCRD found new farmers who were farming traditional systems (i.e., they were not using synthetic chemicals) in remote districts of the province, and at the time of the research approximately 200 farmers were involved. These farmers were ostensibly provided with minimal training in composting, although more than half the farmers I spoke with told me they had not received any training. The NGO director considered "traditional" systems to be synonymous with "organic" rice systems despite the fact that many farmers who had resettled in the area postconflict told me that much knowledge of soil-enhancement techniques had been lost in the more than 20 years of conflict, or that they did not have time, energy or livestock resources to produce

and gather manure or use other means to enhance fertility. The farmers I spoke with who were no longer involved with the project were bitter, and one farmer told me that she had adapted her farming system with the expectation of receiving a 20 percent premium for her farm's rice, but now the organization had pulled out and the fragrant variety she had planted in half her fields was not one her family or others at the local market were interested in eating.

Cambodian Center for Study and Development in Agriculture (CEDAC)

The Cambodian NGO CEDAC, funded by the German Development Service (DED), Oxfam Great Britain, and others, runs the largest organic agriculture project in Cambodia. The head of CEDAC, Dr. Koma, reports that the organization began in 1997 and now works with over 3,600 families in 434 organic-rice producers groups. Farmers interested in organic production receive ongoing training through extension agents and peer trainers (i.e., farmers further along the organic conversion process who are paid for their time), including organic techniques (such as use of leguminous cover crops, integrated vegetable gardens, compost and Effective Micro-Organism production), System of Rice Intensification (SRI),[2] savings groups, and livestock and vegetable production. CEDAC developed its own certification using Internal Control System (ICS) inspection and instituted a diverse set of marketing activities for the surplus rice and other produce households produced, including forming producer cooperatives to exchange vegetables from home gardens, assisting farmers in opening stalls selling organic produce at local wet markets,[3] and developing a brand, "Natural Agri-Products" (NAP), which is sold through CEDAC-owned shops in Phnom Penh and Siem Reap. CEDAC has a fairly decentralized strategy that involves field officers stationed in different regions and organizing techniques and marketing activities with specific farmer members (although the overall organizational vision is communicated in a top-down approach, which is well critiqued by Feuer (2009)). This strategy means that growing techniques and marketing activities can be tailored for specific areas depending on farmer needs and ecological conditions. For example, in one village in Prey Veng Province, the CEDAC organic group composed of 10 women had successfully organized a stall at the local wet market, where they took turns transporting their produce (by bicycle) and selling on behalf of the group and were able to attract regular price premiums for produce at the local level. Since 2009, CEDAC has begun exporting rice from a producer group in Takeo (made up of approximately 250 households) to the U.S. through Lotus Foods.

Broadening the Debate over the Viability of Organics

In this section, I discuss the case studies presented in relation to the debate over whether organics and other agroecological approaches may benefit smallholder farmers, or may instead entrench poverty by limiting other options for off-farm livelihoods or high-input agriculture. I suggest that several implicit assumptions underlie much of the research informing this debate, including the prioritization of short-term economics (particularly farm-gate prices) in the analysis, and the tendency to assume farmers are a homogenous category of rational economic actors who may freely move to non-agricultural pursuits or into high-input agriculture. I structure the discussion by drawing out four themes from my case studies that show how the debate can be broadened through greater attention to people's diverse (and often non-economic) reasons for pursuing various livelihood options, and to the wider economic, social, and political contexts that structure people's choices.

1. Going beyond "homo economicus" to understand why people choose to farm organically.

A focus on enlarging urban and off-farm opportunities for rural people assumes that people *want* to leave rural areas and that — like the "homo

[2] System of Rice Intensification (SRI) is a collection of techniques for enhancing rice productivity, under conditions of little or no chemical fertilizers. See http://sri.ciifad.cornell.edu/

[3] Wet markets are a collection of stalls selling fresh meat and produce (differentiated from dry markets which sell durable goods like cloth and electronics).

economicus" rational, self-interested actor who can freely choose between livelihood options — there are plentiful opportunities into which people move. This assumption is challenged by the growing movements of people around the world who are mobilizing against the conventional food system and defending their rights to a peasant life (McMichael, 2008; 2010); the increasing number of protests in Cambodia over land grabs in recent years are testament to this (Schneider, A. E., 2010). Certainly, some rural people — particularly young people — dream of city life and leaving the physical, isolated work of farming, and I do not suggest a romantic vision that all rural people have a primordial attachment to the land. However, research from Cambodia shows that in many cases, people leave land-based livelihoods because they feel there is no other choice, rather than from a desire to leave (FitzGerald & Sovannarith, 2007; Schneider, H., 2011). The organic farmers in my study expressed a desire to maintain their farm and a fear that indebtedness and sickness would cause them to sell their land.[4] I asked research participants how they balanced farm and off-farm livelihoods and why they continued to farm rather than leaving the area as some of their neighbors did. Despite talking about the hard life of a farmer, many farmers said they did not want to go to the city and wage labor would only be spent on buying rice for the family; for example, one farmer from Takeo expressed a sentiment I heard many times during my research: "If we did not [farm] we'd all have to work as laborers and we would spend the income on food anyway" (Takeo, male). Many farmers said that the land and rice itself had value that was beyond a food source or economic commodity. In one village in Takeo with proximity to Phnom Penh's labor market, where the majority of households said at least one family member lived away from the area for work opportunities, many people articulated that if they could just make ends meet, they would choose to keep their family together in the village. When I asked farmers what was most important in their idea of a "good life," the majority of people (regardless of gender, wealth, or land ownership (whether renting or owning their plot)) spoke of their desire for self-sufficiency in terms of growing enough rice to feed their family.[5] Growing "enough rice" meant more than just providing food; people talked about the ability to obtain health care, give their children an education and a big wedding ceremony, maintain livestock, enable them to remain in the countryside, save as a kind of insurance policy in times of need, and provide offerings for the *Wat* (temple). There were interesting contradictions between people's desire to stay on the land and the desire for their children to be educated and gain a position in the city. Migration remittances from family members working in the city or in Thailand or Vietnam were a key aspect of many of the farmer's livelihoods and these were sometimes seen as allowing families to stay on their land. While some interviewees (particularly the teenage daughters of farmers in areas close to Phnom Penh) spoke of their desire to move to the city, others were concerned that city life was a trap, for "people think there are jobs in construction or factories, but they don't find any and end up living on the street or coming back here with nothing because they sold their land" (Pursat, female). Stories abounded in several villages about relatives or neighbors who had gone to the city and failed to find work or been sent back with debts to pay, yet the redecorated houses, motorbikes, and other status symbols of some families that received remittances were testament to the economic benefits of migration for some. These contradictions reflect in part the limited off-farm job opportunities in many urban areas of Southeast Asia (Li, 2011), and growing under-employment, 3D[6] jobs, and urban slums. While unemployment is still relatively low in Cambodia (NIS, 2010b), this is changing as the population age

[4] This is not to suggest that this research is representative of all rural people in Cambodia; this is a self-selecting group of farming households whose desire to maintain the viability of their farm is strong enough to engage in the organic project. However, this research involved seven communities from various parts of the country, showing that the desire to maintain a land-based livelihood is significant.

[5] Other common sentiments were a desire for good health, control over their future, overcoming vulnerability, access to land, control over how and what they grew, and freedom from dependence on others.

[6] Dirty, dangerous, and demeaning (Connell, 1993).

structure[7] and urban migration mean that 300,000 young people each year are entering the labor force (NIS, 2010b). Access to urban employment is also structured by people's location; in Pursat Province I found that farmers in a roadside village had a much higher level of migration than farmers in villages further away from the paved road. A frequent lament among many farmers in my study was the lack of income-earning opportunities in the village that might allow them to pursue own-farm and local off-farm livelihoods. Agrarian concerns were at the heart of many farmers' conceptions of the "good life" in my research and were not expressed by participants as contradictions to their desires for their children to have an education and a job in the city. Farmers expressed a desire to have *choices* in planning their livelihoods rather than feeling they have no choice but to leave the land.

2. Going beyond farm-gate price to assess broader economic and non-economic impacts. Analyzing farm-gate price alone in a context of uncertain organic price premiums can lead to a conclusion that there is a negligible income benefit from organics. In my study, however, many farmers reported increased household incomes through either lessening dependence on external purchased inputs and/or increasing productivity in rice fields. Farmers with certification or a regular organization-sourced market outlet did receive price premiums of 10 percent (for CEDAC rice and vegetables) and up to 20 percent (for fully certified rice in GTZ and CCRD initiatives). For some farmers this price premium meant increased income of US$50–US$150 for the season (although note that these premiums were not realized long-term, as the following section explains). Most noncertified farmers did not receive price premiums for their produce, although in two CEDAC farmer groups, farmers were able to negotiate slightly higher prices (10 percent over market price) at a group stall at the local wet market (not incidentally, this was in a town where the local CEDAC extension officer enjoyed a close relationship with local political leaders who supported the group), and through meeting a local trader as a group at one of the farmer's houses.

One farmer newly converting to organic in a noncertified CEDAC project in Takeo reported that her yield had decreased slightly and the prices received for her rice had not changed, so her income was down from the previous year, but she noted, "when we include chemical expenses, we used to spend 300,000 riel, and now we use our own compost and buy some dung for a cost of 100,000r. So we are making 50,000r [US$12.50] more now and I think our yields will increase." This farmer was one of only three farmers in my study who said that yields had decreased (the other two were members of the CCRD initiative); most farmers (45 of 57 farmers) observed the productivity of their farms had increased since organic conversion. This is significant given that debate over yield in organic agriculture rages on, with recent review studies assessing the global potential for organics to "feed the world" coming to contradictory conclusions (Badgeley et al., 2007; Seufert, Ramankutty & Foley, 2012). This study was not a systematic comparison with conventional farmer plots, and favorable weather conditions in many areas in the season preceding the study meant rice yields generally improved nationally; however, farmers with both conventional and organic fields also reported that their organic fields were producing higher yields than their conventional fields.[8] Large yield increases were experienced by CEDAC farmers converting from traditional systems where no soil improvement techniques were previously used, to organic systems utilizing organic compost and SRI production

[7] Cambodia experienced a post-conflict baby boom in the 1980s that has produced a rapid population increase (from 8 million in 1998 to 14 million in 2008 (NIS, 2010b), and an age structure weighed heavily toward young people.

[8] This should not be taken as a general causative finding, as this is not a statistical study and was based on a relatively small group of farmers through recall of yields. Several points should be kept in mind when discussing yield increases: where other alternative production methods, such as SRI, were introduced in conjunction with organic systems, yields may be higher; a number of farmers have increased and diversified their production (for example, growing vegetables where before they grew only rice); and weather was favorable in some areas over the 2005–06 growing season, and therefore yields may be higher because of environmental factors.

techniques. Some farmers converting from conventional systems (where chemical inputs were previously used) also reported experiencing yield increases. The most common reasons farmers gave for higher yields included (from those most often mentioned): the use of compost, more care taken in weeding, the use of SRI methods, raising the banks around the rice field to retain organic fertilizer, ploughing in crop remains, digging ponds, access to seed, and investing in other resources such as cattle. The CCRD project was the only site where yields did not generally improve, and this appeared to be due to the minimal changes in farming systems; as noted above, most farmers were not using soil-enhancement techniques (as many said they had received no training), and many of the poorest households did not own sufficient livestock to produce manure, or lacked land or labor due to increased migration for wage work.

Beyond economic aspects, decades of research on the multiple dimensions of poverty and well-being indicate that non-economic facets of poverty are central, although these are often downplayed in research due to the difficulty in quantifying them and the tendency to see economics as overly determining (Sen, 1999). In this study, when I asked people about the greatest benefit to them of farming organically, the majority of farmers converting from conventional farming systems cited an improvement in health. Many farmers said they experienced fewer incidences of dizziness, stomach problems, diarrhea, vomiting, and headaches. Considering that many farmers in Cambodia are reported to experience chemical poisoning due to improper use of agrochemicals (Environmental Justice Foundation [EJF], 2002), this result perhaps is not surprising. Some believed this was due to relief from chemical poisoning, while others felt the health improvements were due to a more nutritious, protein-rich diet. Some farmers reported fewer hospital visits, which they said enabled them to save money, while others reported more hospital visits as they now had the income to seek cures for chronic illness. All farmers in the CEDAC and GTZ initiatives, and several in the CCRD initiative, said they were more food-secure since joining the organics initiatives.[9] Farmers in the CEDAC projects (where integrated home vegetable gardening and fish production in organic rice fields was promoted alongside organic rice techniques) reported greater nutritional diversity due to the ability to grow more vegetables for eating and from selling premium-priced and/or larger amounts of farm produce, which allowed families to buy more protein-rich food. Although these farmers did not include non-rice production in their yield estimates, the multiple crops grown in and around rice fields were important sources of diversified diets and incomes.

An additional non-economic benefit pointed out by many farmers was greater community collaboration with other farmers in the organic project. Farmers said relations with neighbors in the organics group had improved as they attended trainings and meetings together, and shared farmer innovations for new organic techniques and ideas for diversifying into vegetable production, mushroom cultivation, and off-season cropping. Farmers also reported joining the organics groups for political and social status in their communities, including connections with urban and international organizations, access to material resources such as discounted seeds, and free meals at training sessions.

3. Going beyond the homogenous farmer to understand who benefits and who loses.

The diversity of interests, resources, and power in local communities is often underemphasized in research that examines farmers as a homogenous group (Scoones, 2009). In this study, while farmers in a range of initiatives could potentially benefit through increased prices, yields, and non-economic benefits, labor constraints and access to resources had a large influence over who joined organic projects and who benefitted. Just over half (31 of 57) the farmers I interviewed perceived labor to increase under organic systems, with labor-heavy

[9] Twenty-three (of 57) farmers interviewed said they did not have enough rice previously and could now fully support their families with enough rice for the entire year. Others had improved by a smaller degree; a minority had always been able to support their family.

tasks cited as nursery preparation, weeding, and compost preparation (agreeing with Scialabba & Hattam, 2002; International Fund for Agricultural Development [IFAD], 2003). All three NGO-sponsored projects tended to exclude the poorest, most marginalized people in the community, as well as the wealthiest; the majority of farmers in all projects described themselves as "poor" or "middle income" rather than "poorest." At a basic level, in order to join the initiatives farmers required access to land and a certain security of tenure, and sufficient labor (or ability to hire labor), which meant that households with little or no agricultural land, and no available labor, could not benefit. I did not find that farmers in areas more accessible to Phnom Penh or other urban labor markets were less likely to join the organics initiatives due to labor shortages, but this was perhaps due to donor or NGO decisions to site projects in areas with less urban migration. As one NGO extension agent told me, he was "not promoting the organic rice programs in this area [close to the National road to Phnom Penh] anymore. People in this village are all going to the city to work, and the old people don't want to take it up." In all study areas, I noted that older farmers whose children had moved away to the city said that labor shortages for some jobs were acute. The projects did not tend to attract upwardly mobile households where multiple adult household members had full-time off-farm income sources, and some non-adopting households I spoke with said they did not have the on-farm labor necessary to be part of the organics initiatives, nor the resources to hire labor. Many farmers, however, noted no change in labor, or a reduction in labor requirements under organic systems. This was particularly the case where SRI techniques were taught as part of the organic training (indeed, for many of the farmers in CEDAC's Takeo project, they equated "SRI" with "organic," as CEDAC encouraged all its organic farmers to use SRI techniques). One focus group had a heated discussion about whether organic farming increased or decreased labor requirements. Some said the SRI method of transplanting young seedlings was easier than traditional methods and argued that this offset the extra labor required for compost and weeding in organic systems. Women-headed households in two CEDAC initiatives said that the organic systems (in which they used SRI planting methods) required less heavy work as young seedlings were lighter to pull and transplant, and that this enabled them to cultivate even though the men in the household were working in Phnom Penh. SRI methods are not synonymous with organic agriculture, but appear to work well in organic and low-input systems in Cambodia (although the benefits of SRI are widely debated in the broader literature ((Uphoff, 2004), and these findings suggest that more research into the abilities for SRI methods to reduce labor requirements in organic systems be pursued (Resurreccion, Sajor, & Sophea, 2008)).

4. Understanding the roles of diverse development actors.

I selected these three case studies in part to disrupt an assumption that organic is equated with a romanticized notion of traditional farming or a certain strategy of export-certified, long-distance trade. The farmers profiled here all considered themselves to be organic farmers, but their marketing and certification strategies differed significantly, and this has implications for whether organics could be considered a benefit or a "poverty trap." A common concern in the literature is the potential for organic certification to come with high costs for farmers, and to be inappropriate for local ecological and social contexts (Friedberg & Goldstein, 2011; Melo & Wolf, 2007). In this study, more than half the farmers in the export-certified groups said they felt that certification was a benefit to them, due to perceived increased trust and access to lucrative markets. However, one central issue with certification was financial cost; the annual payment for an external inspector for the GTZ and CCRD projects was estimated by different groups to be between US$500–US$2,000 per day for up to three days of inspection (plus their travel costs from Germany). The development agencies were paying this cost at the time of research, but this left the farmers in a vulnerable position as they felt there was no way they could finance the certification costs for the long term. As one GTZ employee said, "in future if nobody steps in to take over

certification costs then it's over." Many farmers said internal inspections (carried out in CEDAC villages practicing ICS certification) were more effective than external inspections, due to perceived higher levels of trust between internal inspectors and farmers, the ability to monitor the farm year-round, and more flexible certification requirements. The dangers of reliance on external funding were illustrated during the 2008 recession, when CEDAC lost a key loan and was unable to purchase much of the rice it had planned to (COrAA, 2011), and in the case of GTZ and CCRD, farmers were unable to maintain their certified status and networks when project funding ended (COrAA 2011).

One requirement for GTZ and CCRD export certification that was not included in CEDAC certification was the need to convert the entire farm to an organic system. Many farmers were not in compliance with this requirement at the time of research, as they preferred to minimize risk by converting only a part of their system, and off-season crops such as cassava were more difficult to grow organically. Some farmers felt that a second requirement for the construction of "buffer zones" around organic rice fields in order to prevent chemical pollution from other fields was difficult to comply with. In one of the GTZ project villagers, a farmer told me she had pulled out of the project as she was one of the poorest farmers in the village and her rice land was in a flood-prone area, where it was impossible to prevent water contamination from the neighboring conventional fields. A further requirement to grow fragrant varieties in certified systems in all three organizations also limited the ability for some farmers to benefit. Development staff said fragrant varieties (including Phkar Roumdoul and Phkar Malis) were essential for entering niche markets, and some farmers felt that the availability of these quality seeds was one of the biggest benefits of the organics initiatives because they fetched higher prices at distant markets and with some local traders. However, these are medium-duration varieties that are generally grown earlier in the wet season; as they are not as tall as long-duration varieties, they are vulnerable to flooding in low-elevation fields (Vang, 2011), and this limited the ability of farmers with unsuitable land to join the projects. Indeed, two farmers said they could not produce organic rice to sell to the association in the current season because the seed variety was not suited to their land. Several farmers said that these varieties were not what they or others in their local area were accustomed to eating, and that they were not suitable for using in some staple dishes. Most farmers therefore grew the fragrant varieties as cash crops but continued to grow traditional varieties for household consumption and local markets.

The case studies show that the ideology and objectives of the development agency have a large bearing on farmer experiences. The tendency to "depoliticization" that often describes development projects (Li, 2007) was observed in all three projects, as the development organizations' tendency to focus on reporting and donor-driven accountability limited the ability of development agents to work with marginalized groups and to acknowledge broader non-economic values. However, the CEDAC project is notable in this regard because of the initial ideology guiding the project's design, which was rooted in notions of farmer independence, health, and food security through household production, and allowed for a broader definition of success than simply fulfilling export shipments. Whereas other projects focused from the beginning on developing organics as a niche market for the Global North, CEDAC's approach to first building household food security and local markets meant that farmers had access to more diverse marketing strategies and were less vulnerable to dependence on volatile long-chain markets.

Suggestions for Further Research

This study could only give a snapshot of farmers' experiences, and while I attempted to move away from an economistic view of organic agriculture's benefits and costs, lack of time meant I was not able to pursue long-term ethnographic research through several growing seasons. To help us understand how households manage multiple livelihood sources, I suggest that further research focus on long-term studies on various organic farming approaches in Cambodia and their

relationships with nonfarm livelihoods and broader structural changes in rural areas. The ambiguous results for labor requirements under organic systems should be further examined, particularly the reasons why farmers experience increases or decreases in labor requirements and the gender dimensions of labor burden. Research on technologies that may reduce labor burden (including SRI and cooperatively owned tractors and other implements) should be pursued to understand their impacts on farmers with different resource levels. My research was limited to social impacts, and more work is needed on the ecological potential for organics to reduce long-term vulnerability to weather events and economic crises in various regions of the country. Finally, comparative research with farmers in areas with high labor mobility (e.g., roadside and border villages) and more remote areas will clarify the relationship between uneven agrarian transitions and farmer experiences of organics.

Conclusion: Pursuing Organic Agriculture Within a Re-Envisioning of Rural Spaces in the Global South

Overall, my analysis shows that participation in organic farming projects is a successful strategy for some households, but it is not a panacea for rural poverty in Cambodia. Direct economic benefits are uncertain; non-economic benefits, broader contexts of uneven agrarian transition, and development agency approaches have a large bearing on the poverty-reduction potential of organics. No development project initiated and managed by people external to a community — and funded by agencies even further spatially and ideologically removed — is likely to be completely empowering or sustainable for farmers. Indeed, as the three case studies presented here show, organic agriculture development projects have the potential to increase dependence on external development agents and exposure to volatile international markets. However, these case studies also illustrate the potential for organic agriculture development projects to have positive outcomes for farmers. The CEDAC projects in particular can be seen as most closely aligned with an agro-ecological understanding that values diversity and farmer knowledge, and farmers in those projects were able to increase their food security and incomes through a variety of techniques and market channels, as well as diversify their farming systems.

Do any of these benefits really matter, though, if they only earn farmers US$50–US$100 extra per season, while sending a family member to Phnom Penh to work in garment factories could net US$50–US$100 per month? The evidence presented here shows that while organic farming is a successful strategy for some households to improve the viability of land-based livelihoods, it is not a panacea for rural poverty in Cambodia by itself. I found it to be inaccessible to households with inadequate labor and land, and some farmers said labor costs increased and certification compliance was difficult. The limitations of the development project as a delivery mechanism and the underlying structural inequalities that remain unchallenged also limit organic agriculture's transformative potential. However, interviewees expressed uncertainty about other livelihood options in some areas, and many of them desired to continue farming while pursuing multiple livelihood strategies. In addition, the non-economic benefits reported (such as better health, debt reduction, and stronger community ties) suggests that any answer to whether organic agriculture reduces or entrenches poverty is complex.

If organic agriculture is pursued as part of a comprehensive rural-development strategy that focuses on diverse elements such as land redistribution, extension, health and education services, and rural employment opportunities, organics can be a vital part of a set of livelihood choices for rural people. Considering the likelihood of continuing fluctuations and price increases in fuel costs and chemical inputs, as well as in transportation, the notion of promoting "modernized" agriculture as the way to address farmer poverty and food security is troubling from a long-term perspective. Finally, considering that rural people may not *want* to leave a farming livelihood, and that rice has value beyond as a foodstuff that can be purchased, I suggest that the terms of the question I posed in this paper need to be altered. We need to move beyond asking whether organics is viable

in a context of rapid transition out of agriculture. Instead, we need to ask how we can support rural communities to be viable, vibrant places, with ecologically sustainable food production at the center of diverse local economies that provide a variety of land-based and off-farm livelihood opportunities for people. Within this vision, organic agriculture can play a significant role. 

Acknowledgements

This research was supported by a Sasakawa Young Leaders Fellowship from the Tokyo Foundation.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Development and evaluation of an introductory course in sustainable food and bioenergy systems

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Submitted July 30, 2013 / Revised October 11, 2013, and November 18, 2013 / Accepted November 18, 2013 / Published online February 8, 2014

Citation: Malone, K., Harmon, A. H., Dyer, W. E., Maxwell, B. D., & Perillo, C. A. (2014). Development and evaluation of an introductory course in sustainable food and bioenergy systems. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 149–161. http://dx.doi.org/10.5304/jafscd.2014.042.002

Abstract

The purpose of this paper is to describe the development, instruction, and evaluation of the undergraduate pilot course, Introduction to Sustainable Food and Bioenergy Systems (SFBS), at Montana State University. Introduction to SFBS is an interdisciplinary, team-taught, experiential education course designed to introduce students to broad array of SFBS-related topics, expose students to career opportunities in these fields, and enable them to establish relationships with food, agriculture, and energy stakeholders. Students completed baseline and follow-up surveys in which they reported information about their backgrounds, values, and knowledge of SFBS-related topics. The surveys also tracked students' learning and allowed them to provide feedback on course methods. According to the follow-up survey, over the course of the semester students demonstrated development of course vocabulary and concepts. Students' experiences in the course prompted changes in their school- and career-related goals. Additionally, the team-teaching approach was highly valued. Students also indicated that teaching should be more solutions-focused. Evaluation of

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students' backgrounds and learning is an important tool for the future evolution of this course and the development of others like it. The survey tool was in its first iteration; it will require revision as the course evolves. Introduction to SFBS can serve as a model for curricula related to sustainable agriculture, food, and energy. Courses like this can prepare students to become informed, innovative, critical thinkers capable of excelling in a multitude of food, agriculture, and energy-related careers. This course will continue to be monitored and evaluated as the curriculum evolves.

Keywords
course assessment, education, Higher Education Challenge Grant, interdisciplinary education, sustainability, sustainable food systems

Introduction

In response to the growing demand for innovation, problem-solving, and comprehensively trained professionals in the food, agriculture, and bioenergy industries, Montana State University recently implemented a novel undergraduate degree program, Sustainable Food and Bionenergy Systems (SFBS). The SFBS program is a nationally unique, interdisciplinary degree program that combines classroom and field-based education to address the production, distribution, and utilization of food and bioenergy. Led by the Montana State University (MSU) SFBS Degree Program Curriculum Development Team, the program currently represents a multidepartment, multicollege collaboration between the departments of Land Resources and Environmental Sciences, Plant Sciences and Plant Pathology, and Animal and Range Sciences in the College of Agriculture and the Department of Health and Human Development in the College of Education, Health and Human Development. The U.S. Department of Agriculture's Higher Education Challenge Grant Program has funded a multi-institution learning community that includes MSU, Washington State University, and the University of Idaho. The purpose of the learning community includes collaborative course development and assessment. The assessment described in this paper is the first piece of that collaboration; it is the baseline assessment in an evaluation protocol that also includes field-based learning assessments, capstone course assessments, exit interviews, and post-graduation follow-up surveys.

The SFBS program's freshman-level, single-semester pilot course, Introduction to Sustainable Food and Bioenergy Systems, was developed and taught in 2009 by the first author. Course themes, goals, and topics were chosen with considerable input from SFBS faculty members and other MSU faculty advisors. Additionally, several food, agriculture and energy stakeholders in Montana were surveyed for recommendations. Course themes included systems thinking, experiential learning, and multidisciplinary teaching. The primary teaching and learning goals of the course were to (1) create a "systems" model of learning by introducing students from diverse backgrounds to a variety of academic topics related to food and bioenergy; (2) expose students to SFBS-related service and employment opportunities; (3) help students establish meaningful relationships with key SFBS stakeholders at the university and in Montana communities; and (4) provide students with opportunities to experience food, agriculture, and energy first-hand through experiential projects and field trips. Topics included agroecology, soil and plant sciences, integrated pest management (IPM), biofuels, climate change, community and public health nutrition, corporate regulation, and public policy.

To assess student's backgrounds, knowledge, and values regarding food and agriculture, students completed an online baseline (pre) survey during the first week of the course and an in-class follow-up (post) survey during the final week of the course. Several of the survey questions were also designed to provide information regarding the level of student learning due to the course, and at entry into the SFBS major, for eventual use in overall program assessment.

The objectives of this paper are to:

1. Share the course design and lessons learned from the pilot offering of Introduction to SFBS, and

2. Present the profile of course participants, and changes in this profile resulting from the course.

Review of Related Literature

Student and faculty demand for interdisciplinary, sustainability-centered education in the university setting is growing. In the United States and internationally, several universities offer multidiscipline, systems-oriented and experiential learning–based sustainable agriculture curricula (Borsari & Vidrine, 2005; Clark, Byker, Niewolny, & Helms, 2013; Delate, 2006; Furgeson, Lamb, & Swisher, 2006; Jacobsen et al., 2012; Keating, Bhavsar, Strobel, Grabau, Mullen, & Williams, 2010; Lieblein, Brelan, Salomonsson, Sriskandarajah, & Francis, 2008; Parr, Trexler, Khanna, & Battisti, 2007; Parr &Van Horn, 2006). According to Francis et al. (2003), there is both an opportunity and a responsibility to evaluate food systems in novel ways, balance the system with existing resources, and acknowledge the moral obligation to manage system outputs equitably. Further, land-grant universities are uniquely qualified to train agricultural scientists, natural resource managers, farmers, and agribusiness leaders (Francis et al., 2003; Jacobsen et al., 2012; Schroeder, Creamer, Linker, Mueller, & Rzewnicki, 2006).

Future professionals will influence how social, cultural, and environmental resources are utilized (Sibbel, 2009). Additionally, professionals must be capable of engaging in critical discourse in situations where stakeholders hold widely varying and conflicting world views (Galt, Clark, & Parr, 2012; Jordan, Bawden, & Bergmann, 2008). Interdisciplinary engagement and experiential learning educational styles encourage students to adopt a broad world view, facilitate a richer understanding of individual disciplines, enhance critical thinking, and provide students with the tools to develop solution-focused problem-solving skills (Holley, 2009; Ivanitskaya, Clark, Montgomery, & Primeau, 2002). Further, McArthur and Sachs (2009) noted that interdisciplinary programs are needed at the collegiate level to generate problem-solvers who are capable of developing and managing innovative and sustainable energy, food, and water resources. Similarly, sustainability-centered university curricula train students to become informed professionals who understand agricultural, environmental, and social issues (Clark et al., 2013).

Discipline-specific learning, hands-on experiences, and communication skill development are vital components of interdisciplinary programs. Graduates of an interdisciplinary agroecology degree program and their employers have reported that problem-solving skills, proficiency in oral and written communication, and practical field experience are highly valued in their professions (Karsten & Risius, 2004). Additionally, agroecology courses can help students address the numerous challenges facing sustainable agriculture (Francis & Altieri, 1992). For example, Pennsylvania State University's Agroecosystem Science major emphasizes experiential learning, problem-solving, learning to work in groups, and developing oral and written communication skills through field trips, guest speakers, case studies, and oral and written reports (Karsten & Risius, 2004). Further, coursework in sustainable food systems prepares students to better understand how their food choices affect the natural resources that sustain food system, how consumer health is related to conditions for farm laborers, and how animal production methods are intertwined with other methods of food production (Harmon, 2002). Though still in its infancy, bioenergy curricula are expanding in Europe and new programs are emerging in the United States.[1] Currently, however, there is a literature gap in bioenergy curriculum evaluation.

The effectiveness of interdisciplinary courses is enhanced when diverse faculty and stakeholders are intimately involved in curriculum development and instruction. Team-teaching methods that emphasize a systemic learning and discovery process facilitate problem-solving in complex situations, enhance communication skills, and

[1] For example, see these resources: Oregon Tech's Renewable Energy Engineering program at http://www.oit.edu/academics/degrees/renewable-energy-engineering; University of Tennessee Knoxville's Bioenergy Concentration at http://www.utk.edu/academics/programs/09/casnr/plant-sciences-bioenergy.html; and the University of Illinois at Urbana-Champaign's Bioenergy Professional Science Master's program at http://www.bioenergy.uiuc.edu/education/major.html

encourage life-long learning (Stonehouse, 1996). Additionally, food, agriculture, and academic stakeholders can provide invaluable suggestions for pertinent curriculum topics (Parr et al., 2007; Trexler, Parr, & Khanna, 2006).

Because of their interdisciplinary nature, such courses often attract students from a wide range of backgrounds. It is common for instructors to provide a quiz or survey near the start of the class in order to better understand the composition of each year's cohort (Karsten & O'Connor, 2002). For example, Karsten and O'Connor (2002) included several questions about bioregionalism in their survey, one of the major themes of the course. They administered the same questions at the end of the course and found a statistical increase ($p < 0.05$) in the proportion of students answering correctly compared to the proportion answering correctly at the start of the course. In this case, the "survey" included both indirect and direct measures of student knowledge that can be used in overall assessment of student learning resulting from the course.

For many years, evaluation of student learning in higher education has focused on exam and assignment scores. Recently, there has been a shift in interest toward assessing student learning outcomes and understanding what students can accomplish as a result of taking a specific course or program of study. One approach to assessment is to survey students on their learning outcomes (an *indirect* measure); this provides the students' perceptions of their learning. A stronger approach is to use *direct* measures through external evaluation of student work. Cook, Wiedenhoeft, Polito, Gibson, Pogranichniy, and Mullen (2006) demonstrate the use of an outcomes-assessment approach within an agronomy course, with the dual purpose of assessing student outcomes with respect to the learning outcomes the course is supposed to meet, as well improving teaching practices within the course. They describe a course-embedded performance measure that provides a direct measure of student progress toward a stated course outcome. Galt, Parr, and Jagannath (2013) use students' reflective essays as an indirect measure of student learning, and demonstrate how learning competencies can be addressed and assessed in a sustainable agriculture curriculum (Galt, Parr, & Jagannath, 2013).

Methods

Course Development and Design

Introduction to SFBS was designed to enhance students' critical and creative thinking capabilities, provide hands-on experiential learning opportunities, introduce students to a variety of SFBS stakeholders, and encourage students to be inquisitive and conscious consumers. The course was also created to give students considering SFBS as a major the opportunity to explore a diverse array of topics.

The SFBS development team, other Montana State University faculty and staff, and stakeholders from Montana provided substantial input for course development through an open-ended survey. Stakeholders included farmers, ranchers, food processors, food retailers, nonprofit managers, policy planners and county extension agents. Instruction combined guest lecturers from a variety of departments and research laboratories on campus, speakers from community organizations, panel discussions, hands-on projects, and field-based learning experiences. The course was divided into three modules: agroecology, sustainable crop production, and sustainable food systems. Specific course topics are listed in figure 1.

It was useful to begin the course by asking small groups of students to create a definition of sustainability based on their previous experiences and current knowledge. Student and scholarly interpretations were then woven by the class to create a general course definition of sustainability: the "ability to last," preserve natural resources, prevent harm, and provide for present and future generations (American Dietetic Association [ADA] Sustainable Food Systems Task Force, 2007; World Commission on Environment and Development, 1987; Dahlberg, 1993). Throughout the course, ways in which individuals can apply the concepts of sustainability and food and energy systems as conscious consumers capable of critically thinking about their choices were discussed. Definitions of sustainable food systems and sustainable energy systems were similarly constructed (ADA

Figure 1. Introduction to Sustainable Food and Bioenergy Systems Course Topics

Module 1. Agroecology
- Sustainability: Framework and Definitions
- Sustainability at Montana State University
- Agriculture in Context: World and Montana Agricultural History
- Ecological Concepts in Agriculture
- Agroecology on a Small Scale
- Agroecology on a Large Scale

Module 2. Sustainable Crop Production
- Nuts and Bolts of Conventional Crop Production
- Nuts and Bolts of Organic Crop Production
- Integrated Pest Management
- Food, Agriculture and Energy Policy, Regulations and Advocacy
- Bioenergy: Overview
- Bioenergy: Camelina in Montana

Module 3. Sustainable Food Systems
- Food Systems Thinking and Modeling: Overview
- Food Systems Thinking and Modeling: The Montana Food System
- Community Food Security
- Community Food Security: Gallatin Valley Food Bank
- Food Justice
- Montana State University Food Service
- Ecological Eating

Figure 2. Introduction to Sustainable Food and Bioenergy Systems Course Projects

1. Personal Experience Project
Students completed one of two experiences:
- Eat Montana Project: Students consumed only Montana-produced and processed food and beverage products for a 24-hour period. Participants documented what they consumed and answered a series of reflection questions about their experiences. Students considered their purchasing, food preparation, and consumption strategies; challenges; lessons learned; and if or how the project would modify their behavior related to food procurement, preparation, and/or consumption.
- Farm Tours: In a large group, students toured three Bozeman area farms and ranches. Participants answered reflection questions about their visits.

2. Organization Report and Presentation
In pairs, students gave a brief written report and presentation about an SFBS-related organization. Organizations included Slow Food International, International Sustainable Energy Organization, Farm to School, Alternative Energy Resources Organization, Patagonia, Feeding America, and the Marine Stewardship Council.

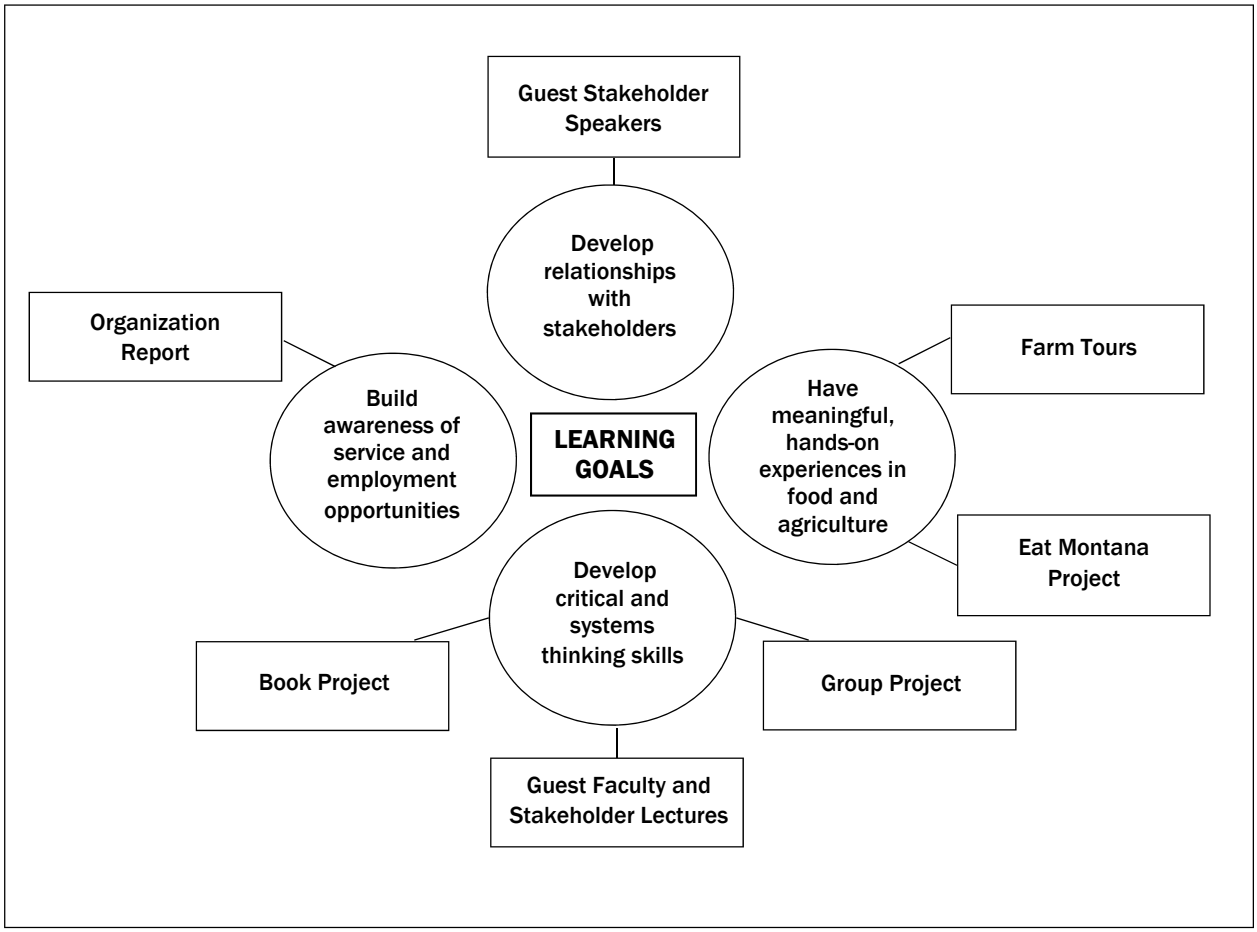
3. Book Project
Students read one of three suggested popular books about an SFBS-related topic and completed a guided reflection paper.

4. Final Project
In small groups, students researched and presented on a SFBS-related topic of their choice. Topics included organic certification, vertical farming and hydroponics, animal production, terrestrial carbon sequestration, sustainable ranching, urban agriculture, coffee production, and genetically modified organisms.

Sustainable Food Systems Task Force, 2007; Gleissman, 1998). Students completed a variety of course projects designed to engage them in food and energy systems (see figure 2). Projects and course activities were designed to support the course teaching and learning goals described above (see figure 3).

Evaluation of student learning and course methodology was integral to this introductory class. Evaluation instruments and procedures were approved by the MSU Institutional Review Board. Students had the opportunity to complete a pre-survey during the second week of the course using the online course management tool. The purpose of the presurvey was to gather data on students' demographics, backgrounds, and prior experience with food, fiber, and bioenergy production, and to assess understanding of course definitions, themes, and topics; food selection preferences; and academic and career goals. For example, students were asked to describe the meanings of sustainability, food system, bioenergy, and systems thinker. Students were then asked to select factors (from a list) that are important to them personally when deciding what to eat. They were asked to describe what they hoped to learn in the course, the value they placed on interdisciplinary coursework, and what they hoped to do in the future. Finally, students were asked to describe what they thought were the most important food and energy issues on local, state, regional, and global scales. The post-

Figure 3. Learning Outcomes Supported by Course Projects and Activities



survey was designed to assess changes in these measures. Additionally, the postsurvey asked students to provide feedback on course methods and offer suggestions for future course topics. The postsurvey was completed on paper in class, in an effort to encourage more students to participate. Twenty-five students completed the presurvey and 33 completed the postsurvey.

Surveys were analyzed as aggregate data to assess the impact of the course on the class as a whole rather than tracking change in individuals. Demographic, background, and food preference results could be tabulated and expressed using descriptive statistics, but most survey questions were open-ended, requiring manual analysis and coding. Common answers and themes were identified for each question. The authors were looking specifically for changes in language from the pre- to postsurvey that would indicate an improvement in literacy in Cardwell's terms (2005).

Results

Student Profiles

Thirty-eight students enrolled in the course. Of the 25 students who completed the presurvey, 84 percent were Caucasian/White non-Hispanic, 8 percent were Hispanic, and 4 percent were Native American. Fifty-two percent were male (48 percent female) and the median age was 20. Thirty-six percent of students were raised in Montana. Additionally, students had completed an average of two years of university-level coursework. Students' current or intended majors included agricultural economics, animal science, biology, civil engineering, education, environmental science, fine arts,

food and nutrition, liberal studies, nursing, political science, sustainable food and bioenergy systems, and university studies.

Twenty-four percent of students had no experience with food, fiber, or bioenergy production; 60 percent had gardening experience; 28 percent had on-farm experience; and 20 percent had ranching experience. Approximately three-fourths (76 percent) of students were motivated to enroll in the course due to personal interest, about half (44 percent) were interested in the SFBS major, 20 percent enrolled because the course was recommended, and 16 percent were required to take the course for the SFBS major.

When asked what they hoped to achieve and/or learn in the course, 36 percent of students reported that they wanted to develop their understanding of sustainability or learn how to be sustainable, while 12 percent aspired to learn about food systems. Students also expressed an interest in learning about bioenergy, Montana's food system and environment, and SFBS-related academic and career opportunities. Fifty-two percent of respondents intended to work in fields related to food systems and the environment.

Student Learning

In both the pre- and postsurveys, students were asked a series of open-ended questions in which they were prompted to define several terms related to sustainable food and bioenergy systems, including sustainability, food systems, systems thinker, and bioenergy (see table 1). Table 1 includes exact quotations from student surveys that are representative of the pool of responses received in order to illustrate the changes that took place over the course of the semester in students' thinking about these terms. When asked to define sustainability, students initially focused on the environment and the future. Generally, they described sustainability as minimizing future damage indefinitely by using practices that are environmentally sound, conserving and replenishing natural resources, and promoting energy balance. Students' postsurvey interpretations of sustainability were more comprehensive. At the end of the course, students included economics, social justice, animal health, and use of non–fossil fuel sources in their definitions.

Students' initial definitions of food system varied widely and included references to "groups of food" and food security. In the postsurvey, 80 percent of respondents demonstrated that they were approaching an understanding of the concept of a food system and described it as including the processes that food undergoes from production to consumption, or from "farm to table."

When defining systems thinker in the presurvey, 56 percent of students indicated that a systems thinker considers the whole rather than only individual parts. Presurvey definitions also indicated a bias towards *food* systems. According to the postsurvey, 70 percent of students believed that a systems thinker was one who thought "holistically," approached problems in a holistic manner, or considered broader consequences and how different parts affect the whole.

In both surveys, students defined bioenergy as renewable, alternative, and derived from biological sources. In the postsurvey, respondents expanded their definitions. Specifically, 40 percent of students stated that bioenergy is also environmentally safe, low-impact, and intrinsically sustainable. In addition to defining terms, students also answered open-ended questions about local and state food systems issues.

Students most frequently cited agricultural land use as an important issue facing the local food system in both the pre- and postsurveys. At the end of the course, students cited agricultural land use, lack of in-state processing, and lack of consumer education as the top three issues facing the local food system. When asked to consider the most important issues facing the Montana food system, students initially suggested that the top three issues were localizing the food system, in-state processing, and support for producers. In the postsurvey, 64 percent of respondents listed in-state processing as an important issue and 21 percent mentioned localizing the food system. Transportation and crop diversity were each reported as important by 12 percent of respondents in the postsurvey.

Many students communicated the importance of interdisciplinary coursework and experiences to their education. In both the pre- and postsurveys, approximately 85 percent of respondents openly

Table 1. Changes in Student Qualitative Definitions for Key Terms from Presurvey to Postsurvey

Presurvey Representative Responses	Key Term	Postsurvey Representative Responses
It means to continue forever. Ultimately keeping the planet as green as possible, caring of what you are putting in and taking out of the earth, and how much you waste. A system of agriculture that puts the same amount of energy back into the land that is taken out.	**Sustainability**	Something, specifically food, that can be maintained indefinitely without harming the environment, available to all, does not harm or do injustice to others in the process. Production that is economically, environmentally, and socially proactive. Developing a system that supports the production and processing of local agricultural products in order to become more self-reliant.
Energy from natural sources such as plants. Chemical energy. Renewable energy from water, wind, solar power etc.	**Bioenergy**	Renewable energy not from fossil fuels that can be produced in an ecologically safe and sustainable manner. Energy that is derived from natural or biological means.
A network of growers/sellers who together produce a variety of crops. All the stages food takes from being put in the ground to being put on your table. The food system involves everything from planting the seed to eating the product.	**Food Systems**	A collection of people, capital, and infrastructure leading to the production and consumption of food. A food system is a form of production and consumption. A food system consists of producers, transformers, distributors, and consumers. Each depend on the other in order for the system to last. Each component also has to be sustainable in order for the system to be sustainable.
To think more broadly. Looking at the big picture the whole time rather than focusing on the little things. To think about how everything fits together.	**Systems Thinker**	Thinking in terms of each small part affecting the whole. A systems thinker is educated on all the aspects of a systems and understands the interactions. Seeing the big picture and how everything is connected.

reported that they were extremely important, very important, vital, or the basis of their education.

Students were prompted to choose from a list of factors that were most important to them personally in deciding what to eat, and invited to check all that applied. In both the pre- and post-survey "like the taste" was the most often checked. Between the beginning and end of the course, the importance of "locally grown" increased from 48 percent to 79 percent students (a 31 percent increase), "sustainably grown" grew from 40 percent to 67 percent (a 27 percent increase), and "pesticide-free" increased from 28 percent to 45 percent (a 17 percent increase) (see table 2).

Students were also asked to freely report the ways, if any, in which what they learned in the class changed their attitudes and/or behaviors related to food and energy. Fifty-five percent of respondents stated that their awareness of SFBS-related issues increased. Specifically, 21 percent of students

Table 2. Factors Important to Students in Deciding What To Eat

	Presurvey (% students)	Postsurvey (% students)	Change Factor (+/–)
Like the Taste	88	80	–8
Price Is Right	68	70	+2
Safety of Food	60	70	+10
Minimally Processed	52	64	+12
Locally Grown	48	79	+31
Sustainably Grown	40	67	+27
Who Produced It	32	33	+1
Pesticide-Free	28	45	+17
Certified Organic	24	24	—
Pre-Prepared Convenience	12	9	–3

mentioned that their awareness of local food issues increased. Eighteen percent of students reported that they will seek out and purchase more local foods. One student mentioned that the knowledge he had gained in the course made him more concerned about future production on his family farm. Fifty-eight percent of respondents also reported that the course prompted a change in their academic and/or career goals, and 45 percent specifically mentioned that the change(s) would include incorporating some aspect of the course in their plans. Four students (12 percent) changed their major to SBFS as a result of their experiences in the course. In addition, 56 percent of students had stayed or intended to stay in touch with one or more of the guest speakers.

Student Feedback

When asked to provide feedback on course topics, 40 percent of students listed bioenergy or biofuels as the most interesting course topic. Respondents also suggested that future course topics should emphasize local food, slow food, climate change, measuring and/or tracking sustainability, animal production, and urban agriculture. Students would have preferred more information on the farm bill, genetically modified organisms, and bioenergy. Several also indicated that future courses should focus more on solutions. Students reported that farm tours, guest lectures from MSU faculty and staff, the "Eat Montana" project, and guest speakers from outside of MSU were the most valuable course components.

Discussion

The course, Introduction to Sustainable Food and Bioenergy Systems, represents a novel approach to teaching and learning in interdisciplinary curricula focused on sustainable food and energy. Throughout the semester-long class, students were introduced to a broad array of topics through guest lectures, hands-on projects, and field experiences. Course themes included sustainability, systems thinking, interdisciplinary and experiential learning, critical thinking, conscious consumerism, and mentoring relationships between students and stakeholders in the food, agriculture, and energy systems.

Shroeder et al. (2006) affirmed the need to clearly explain and define key course concepts in sustainable agriculture courses. Similarly, several surveyed Montana stakeholders urged instructors to clarify the definition of sustainability in particular. Key terms and concepts such as sustainability, food system, and bioenergy were introduced to students early in the course and revisited regularly.

Shroeder et al. (2006) also urged instructors to provide students with ample opportunities to interact with and learn from each other. Having students with diverse backgrounds enabled constructive debate as well as opportunities to share and understand varied perspectives on a variety of SFBS issues. Moreover, facilitating open classroom discussion and project debriefing sessions as well as permitting students to complete projects on topics with which they had personal and/or professional experience created a more intimate learning environment.

Survey responses at the start and end of the course indicated that the course affected students in myriad ways. Coming into the class, students wanted to learn about food systems, develop their

understanding of sustainability, and learn how to develop sustainable practices. Over the course of the semester, students demonstrated development of course vocabulary. Similar to experiences described by Lourdel et al. (2007) following a survey of students in a sustainable development course, Introduction to SFBS students showed a more comprehensive understanding of sustainability by the course's conclusion. Similarly, their definitions of food systems, systems thinking, and bioenergy broadened. In Cardwell's (2005) terms, students seemed to advance from nominal food and bioenergy system literacy to functional, cultural, and in some cases multidimensional literacy. With regard to food purchasing habits, students viewed sustainable production methods, locally grown status, and who produced their food considerably as more important at the end of the course compared to the start of the semester (Farenga & Ness, 2010).

More than half of the students reported that the course affected choices related to their future studies and career goals. Similarly, more than 50 percent indicated that they intended to work in fields related to food systems and the environment. Several students became SFBS majors during the semester. Students also indicated that interdisciplinary coursework and experiences are important to their education. Further, many students formed lasting relationships with SFBS stakeholders.

Overall, students found the farm tours and guest lectures to be the most valuable course components. This finding is similar to Karsten and Risius (2004), who reported that hands-on work, farm visits, and guest speaker series were highly rated by students in a sustainable development course. Though formal class discussion about bioenergy was limited to two lectures, nearly half of the students reported that it was their favorite course topic. Bioenergy will likely play a critical role in Montana's future economy and therefore warrants expansion in the curriculum (Bradley et al., 2007).

Implications

Courses like Introduction to SFBS should challenge students and educators to think more critically, creatively, broadly, and collaboratively. The execution of this pilot course reflected long-term planning, reliance on interdisciplinary partnerships, highly invested and diverse instructors and stakeholders, motivated students, and pertinent field experiences. The future of the course will depend largely on the factors that serve as its foundation: student and faculty driven initiatives; technological advances related to food, agriculture, and energy; political and economic policy; and socio-cultural influences.

The interdisciplinary nature of this course presented numerous challenges for development and teaching. One specific challenge is determining how to best connect with a class of students that varied in year, background, and academic preparation for study in sustainable food and bioenergy systems. Unlike more disciplinary courses, this course experience did not fit neatly into a logical progression of content. Students arrived from different places in their academic experiences, and the challenge for the instructor was how to make the material interesting and meaningful for each individual — encouraging each to grow and develop on his or her own path. Most of the learning goals for the course transcend content. For example, building relationships with stakeholders, developing critical thinking and systems thinking skills, improving awareness of service and employment opportunities, and engaging in hands-on learning may be novel for students at any level in their university program and effective for encouraging professional development in this interdisciplinary field.

As evidenced by survey responses regarding food purchasing priorities, career and academic goals, and lifestyle adjustments, courses like this provide opportunities for students to consciously adjust their priorities and behaviors as consumers and community members. Both the etiology and consequences of these changes may warrant further in-class discussion.

Students suggested that future courses should incorporate more discussion about local food, urban agriculture, animal production, and methods for measuring and tracking sustainability. Instructors may also consider integrating a lecture on water access, quality, and policy. Moreover, several students noted their desire for a more solutions-

based learning environment. Incorporating more case studies and providing more opportunities for students and stakeholders to interact directly and address problems together may facilitate development of solutions.

Future courses would be enhanced by inviting input from a wider array of professionals, recruiting more non-White students, and creating more space for small-group sharing. Further, we recommend implementing a course fee and seeking grants for off-campus field trips. Finally, there is a need for additional collaboration with Animal Sciences and the College of Engineering to address the demand for the inclusion of animal production and more discussion about bionenergy. On the community and state level, it is clear that students recognize that agricultural land use and lack of in-state food processing are critical issues facing the local and Montana food systems, respectively. One additional lesson learned is that in courses where students are exposed to multiple perspectives through guest faculty and stakeholder presentations, they will need some time with a consistent instructor to process, question, and reconcile contradictions in what they have heard. This would be beneficial in increasing competence in systems thinking. *Learning* what a systems thinker is differs from *becoming* a systems thinker, which will likely require many courses beyond this one, additional hands-on experiences, and more opportunities to address systems problems.

The future of food and bioenergy systems depends considerably on actions and achievements at universities. The SFBS curriculum will continue to use embedded assessment as recommended by Cook et al. (2006) to help instructors facilitate students' development of multidimensional literacy in food, agriculture, and bioenergy systems education (Cardwell 2005). In conclusion, Introduction to SFBS and the degree program for which it is the foundation will continue to be improved and assessed over time, striving to promote the advancement of sustainability and interdisciplinary education and influence the future of food and bioenergy systems.

Acknowledgement

The authors wish to acknowledge the first graduating class of the Sustainable Food and Bioenergy Systems degree program at Montana State University and all the members of the MSU, Washington State University, and University of Idaho Sustainable Food and Agricultural Systems Education Learning Community. Special thanks to Ashley Ater-Kranov for her assistance with developing the curriculum assessment tool. Finally, we would like to acknowledge support from the USDA Higher Education Challenge Grant Program.

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Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Can large retailers localize supply chains? A case analysis of the challenges facing one Canadian retailer

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Submitted October 1, 2013 / Revised January 10 and January 29, 2014 / Accepted January 30, 2014 / Published online March 19, 2014

Citation: McCallum, D., Campbell, A. M., & MacRae, R. (2014). Can large retailers localize supply chains? A case analysis of the challenges facing one Canadian retailer. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 163–176. http://dx.doi.org/10.5304/jafscd.2014.042.015

Abstract

Extensive access to a major Canadian retailer (referred to as the Company) provided an opportunity to understand more fully its challenges when buying local food. Many of the Company volume and quality requirements of vendors are difficult to meet because they require a scale sophistication that is typically absent for local growers. Particularly challenging are the needs to lengthen product life, coordinate transport, and aggregate supply. Liability associated with spoiled product is especially onerous for small growers. Using a value supply-chain framework (Stevenson & Pirog, 2008), we conclude that the steps taken by the retailer toward localization will not be successful without significant investments in product differentiation, the financial health of their supplier base, strategic alliances, and shared governance.

Keywords

localization, national food retailer, supply chain, value chain, Canada

Introduction

Rising concerns regarding the health and environmental impacts of food have caused both farmers and consumers to create and support more spatially localized food networks, to reduce intermediaries[1] and create direct exchange. By differentiating themselves from conventional food chains, farmers hope to obtain a greater percentage of the food consumer dollar (Howard & Allen, 2006) or enhance access to domestic consumers. Equally important, as stated by Kneen (1993), is the disassociation between consumers and growers that is created by long-distance movements of food:

> What is mourned as farmers depart the land, as the government and its Market Economy agents dismantle the infrastructure of rail lines and schools and public services, is the possibility of community. (p. 73)

Related to this, many food producers and processors support a production and processing

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[1] Outlined by Kneen (1993, p. 26) as "exporters at one end to retailers at the other, and including the manufacturers of farm 'inputs' like hybrid seeds and agro-toxins."

system that is different from "mass produced" food.

> The notion of "difference" becomes critical to the process of reconnection: creating a difference in "quality"'between specific products and mass-produced products; creating a difference between geographical anonymity in food provenance and territorial specificity; and creating a difference in the way certain foods are produced.
>
> (Ilbery, Morris, Buller, Maye, & Kneafsey, 2005, p. 118)

This "process of reconnection" has the promise of allowing farmers to take home a greater return than is provided by conventional food markets, increasing consumer confidence in food production, and placing a greater focus on rural development, thus strengthening a local, sustainable food system (Winter, 2003).

Having started with small and medium-sized enterprises, the localization process has attracted the interest of mainstream supply-chain actors, including large retailers. The purpose of this paper is to examine the necessary conditions for the inclusion of locally produced fruits and vegetables in the supply chains of major grocery retailers in Canada. Canada's food retail environment is dominated by three national chains that control, according to differing estimates, from 62 percent (Industry Canada, 2013) to 75 percent (estimated from Agriculture and Agri-Food Canada, 2009) of the food retail market place.[2] Although these retailers are smaller in absolute terms than the largest U.S. food retailers, their relative market position is much stronger. Consequently, our working hypothesis is that retailers of this market size will face some challenges that are not entirely the same as small to medium-size retailers. Few studies have looked at the issues from the perspective of a major retailer, instead examining issues for small to medium-size producers (e.g., Barham, 2009; Day-Farnsworth, McCown, Miller, & Pfeiffer, 2009), intermediate aggregators, distributors and retailers (e.g., Diamond & Barham, 2012; King et al., 2010), or emerging food hub structures.[3]

To this end, a review of the relevant supply-chain transformation literature was undertaken and a close case study was conducted of a major grocery retailer in Canada, henceforth referred to as the "Company." We report on how the Company purchases, organizes, distributes, and sells locally grown fruits and vegetables throughout stores across Canada, in order to gain a fuller appreciation for the challenges of localization. We analyze the main obstacles facing the Company, how and why those problems have developed, and some suggestions for improving the flow of locally produced food into the supply chain in ways that are consistent with the values and attitudes associated with the localization phenomenon.[4]

We used publically available information (grocery industry newsletters, annual reports, media reviews, and government documents), corporate documents supplied by the Company, and data collected through the field study. Given the limited number of national retailers, the Company was selected based on existing contacts of the lead author. The lead author toured distribution facilities and stores, had access to the Company's head office staff, held group interviews with regional distribution center staff in a variety of capacities, was granted access to confidential corporate reports, and held a series of interviews with the individual in charge of the produce business unit at the national level. Field notes were recorded, from which patterns were identified that became the basis for triangulation with the other data sources.

Localization: A Review of the Supply Chain Transformation Literature

There is, of course, much debate about how to define local foods. For this analysis, it is sufficient to categorize local as subnational food supply chains, conforming to provincial boundaries or smaller regions (Louden & MacRae, 2010). Agriculture and Agri-food Canada (2003–2011)

[2] In 2013, Loblaw purchased Shopper's Drug Mart and Empire (Sobey's) purchased Canadian holdings of Safeway.

[3] See the special issue on food hubs in *Local Environment 18*(5).

[4] Note that we are not providing a broader critique of the merits of large retailer participation in local food chains.

reports that roughly 70 percent of Canadian consumption is met by domestic production and that 50 percent of domestic production is exported, particularly live animals, bulk grains, and oilseeds. There are reports on local food initiatives (Canadian Organic Growers, 2007), but limited data on how much food flows through subnational chains. Agriculture and Agri-food Canada (2003–2011) also reported that only about 1 percent of retail food sales were direct marketed, but direct marketing is a small subset of local distribution. Canada's supply-managed commodities (primarily dairy, eggs, chicken and turkey) are largely organized provincially, with restrictions on cross-border trade. British Columbia estimated that its producers provided 48 percent of the food consumed in the province (British Columbia Ministry of Agriculture and Lands, 2006). Undoubtedly the sector is larger than these statistics suggest, but its exact size is unknown.

Despite confusion about what local means, food system localization has gained considerable traction among academics and non-academics alike, including an increasing number of policy-makers. The academic discussion has centered on the environmental, social, and economic implications of local food systems, both positive (Norberg-Hodge, Merrifield, & Gorelick, 2002; Pirog, Van Pelt, Enshayon, & Cook, 2001) and sometimes critical (Born & Purcell, 2006; Edwards-Jones et al., 2008; Weber & Matthews, 2008). Other studies have focused on the social "embeddedness" of localized supply chains and the community-building impacts of reducing the "social" distance between producers and consumers (Hinrichs, 2000; Sage, 2003). An essential part of this perspective is the information flows that distinguish "short food supply chains" from the conventional food system (Feenstra, Allen, Hardesty, Ohmart, & Perez, 2011). Marsden, Banks, and Bristow (2000) explain that "A key characteristic of short food supply chains is their capacity to re-socialize or re-spatialize food, thereby allowing the consumer to make value-judgments about the relative desirability of foods on the basis of their own knowledge, experience, or perceived imagery" (p. 425). Finally, based on the local economic contributions of local food supply chains, some authors have suggested localization as an effective rural development strategy (Renting, Marsden, & Banks, 2003).

On the ground, this has resulted in the development of alternative avenues for the distribution of locally produced food; two complementary concepts, alternative food networks (AFNs) and short food supply chains (SFSCs), have been used to describe these avenues. AFNs and SFSCs are directly tied to the re-localization movement and have been discussed broadly as concerted responses to a crisis in conventional agriculture (Feagan, 2007). The conceptualization of AFNs can be located within the recent transition from speaking about food *systems* to a new tendency of focusing on food *networks*. This tendency reflects a shift towards thinking relationally, in terms of "flows, processes and relationships" that make up a system, rather than of a system as a static entity (Kneafsey, 2010, p. 3). Speaking in terms of networks may also act as a language to navigate the use of nuanced terms, such as "local" and "alternative," that fail to fully capture the complexities and "contested and contingent relationships" characterizing the ways in which food is made available (Kneafsey, 2010, p. 3).

On the consumer side, the emergence of alternative systems of food provision has been driven by increased public concern over issues such as food safety, animal welfare, and the environment (Renting et al., 2003). Widespread food safety scares, such as those stemming from outbreaks of salmonella and bovine spongiform encephalopathy (BSE), have contributed in particular to growing distrust of the conventional food system. Pressures on the producer side have also contributed to the emergence of alternative food distribution avenues. With an income squeeze being felt by small and medium-size farmers, innovative ways of increasing farm revenue have become increasingly attractive (Renting et al., 2003). In this sense, AFNs and SFSCs are viewed as mechanisms to improve farm revenues by increasing the value-added qualities of farm products, as well as by reorganizing the supply chain such that farmers may capture a greater share of the retail dollar.

Renting et al. (2003) note that as AFNs become more widespread and increasingly diverse,

"there is an urgent need for more specific concepts that help us grasp the variability of AFNs and begin to provide an improved 'toolbox' with which to explore the heterogeneity of AFNs" (p. 394). The authors state that "AFNs, by their very nature, employ different social constructions and equations with ecology, locality, region, quality convention, and consumer cultures" (p. 394). Thus, while broader analyses of alternative food networks can provide us with a sense of the ways they collectively respond to the crisis in conventional agriculture, understanding the spatial and social distinctiveness of different models of AFNs is necessary to discern their strengths and weaknesses and the diversity of goals to which they may be suited.

SFSCs offer a second conceptual phrase for similarly describing alternative avenues of food distribution. While conceptually very similar to alternative food networks, SFSCs center specifically around the food chain dimension, juxtaposing alternative "short" chains against the "long, complex and rationally organized industrial chains" (Marsden et al., 2000). In deciphering the semantic differences between such emerging concepts, Renting et al. (2003) suggest that the "SFSC concept is more specific than AFNs, and, rather, covers (the interrelations between) actors who are directly involved in the production, processing, distribution, and consumption of new food products" (p. 394). Significantly, a focus on the supply chain as the center of analysis recognizes the role supply-chain reconfiguration plays in the development of alternative food networks.

Renting, Marsden, and Banks (2003) use two interrelated dimensions to explore the morphology of short food supply chains: (1) the organizational structure and the specific mechanisms utilized to extend relations in time and space; and (2) the different qualities of the definitions and conventions involved in the construction and operation of SFSCs. On the basis of the first dimension, the authors identify three main types of short food supply chains:

- *Face-to-face:* Consumers purchase products directly from a producer or processor, ensuring authenticity and trust through personal interaction.
- *Proximate*: Consumers purchase products from retail outlets within the region where the product was produced and are made aware of the local nature of the product at the point of sale.
- *Extended*: Consumers purchase products outside their region of production; however, the products themselves nonetheless carry information regarding the place of production.

(Renting et al., 2003, pp. 399–400)

Besides their organizational structure, SFSCs are also distinguished by the product information they convey to consumers, making them particularly relevant to localized chains. Because information flows are so effectively maintained within SFSCs, consumers are able to connect with the place of production as well as to the production practices employed; this allows for product differentiation upon which consumers may make value-driven decisions, as well as for producers to potentially command price premiums based on the value associated with the embedded information (Marsden et al., 2000). What distinguishes local food supply chains from mainstream supply chains, according to a U.S. Department of Agriculture (USDA) research report, is the former's use and conveyance of information to allow consumers to recognize products as local; through this informational exchange, local food supply chains "strive to establish a bond between the producer and the consumer" (King et al., 2010).

Another concept potentially applicable to major retailer involvement in localization is that of transitional food system change: piggybacking on the dominant system to advance desirable changes in supply chains (Bloom & Hinrichs, 2011). This is part of the value chain approach (Stevenson & Pirog, 2008) that builds on some aspects of traditional supply chain analysis (such as scale and efficiency), but with the added dimension of values-based production and distribution (in this case localization and its potential benefits).

While local food systems are growing and strengthening rapidly, this growth has faced a number of constraints. In the report *Bringing Local Food Home,* the Canadian Institute for Environ-

mental Law and Policy notes that "despite the strong demand for local food and a robust seasonal supply, the market is not yet delivering local food to the extent that consumers want it due to a variety of systemic barriers" (Carter-Whitney, 2008, p. 1). One of the most common systemic barriers is the lack of "infrastructure needed to locate and coordinate the communication, planning, processing, tracking, and distribution of farm produce to institutions" (Vogt & Kaiser, 2008, p. 248). Lack of suitable infrastructure has likewise been identified in numerous other cases (Bittner, Day-Farnsworth, Miller, Kozub, & Gollnik, 2011; Day-Farnsworth et al., 2009; Feenstra et al., 2011; Food Links UK, 2006).

The major retailers have, of course, significant infrastructure, but is it suitable for meeting the needs of local producers? Can major retailers participate in localized supply chains without compromising either the integrity or value of the product? Further, can they provide a sense of connection to people and place — consistent with the efforts of other AFNs and SFSCs — that consumers seek through the purchase of local food? We explore these questions below in the context of the produce supply chains of a major retailer. We first describe how the Company operates and understands the logistics in its supply chains, and then provide our analysis of the implications for localization.

The Company

Organization of the Produce Business Unit

Broadly, the Company is broken up into a series of business units or management categories, including grocery, meat, dairy, and produce. Each of these units has two aspects built into its design: first, to act, essentially, as a separate business responsible for creating, implementing, and evaluating policies that exist to generate revenue and improve efficiency; and second, to act as a member of the overall business, exposed and subject to the decisions made by the executive branch of the Company. This allows each unit, in theory, the flexibility to make policies to adapt to new changes in the business environment or to react to the introduction of new government regulations. Through this structure, each unit has both the liability protection of the Company and the flexibility to make decisions without waiting for approval from all departments at the corporate level. This paper will focus on the actions of the produce business unit only, because produce raises interesting issues, is a priority for environmental improvements related to localization (MacRae, Cuddeford, Young, & Matsubuchi-Shaw, 2013), and regulatory and corporate responsibilities are sufficiently different from one unit to another, making the study of more than one business unit at a time challenging.

Throughout the season in which the bulk of "local food" sales take place, the Company promotes products by region. Within the produce business unit of the Company, there are three primary regions that are used to manage the unit. Quebec and Atlantic Canada make up the first, then Ontario, and Western Canada (which includes the prairies as well as the west coast). For the purpose of this paper, the term "local food" will mean any product that is grown and sold within each of the regions mentioned above. However, it is important to note that according to the Company, only people in Ontario consider produce shipped in from other provinces not to be "local food." The remainder of the country is happy to consider product produced in other provinces to be local, except produce from Ontario. Consequently, the Company tends to take a more regional approach to local food definition as compared to the literature.

The produce business unit is based around three separate sub-units (A, B, C), each of which is responsible for a particular grouping of products. Each sub-unit is responsible for purchasing, generating revenue, and reducing costs in order to meet the unit quarterly and yearly goals. Each sub-unit is managed by a category manager and assistant category manager, who are responsible for tracking and procuring inventory for the distribution centers. Through this model, these managers work with vendors to receive better pricing based on sales volume and negotiation.

The distribution center acts as both the customer of vendors, and vendor to the retail stores. In this model, communication between

stores and the category managers is central, because without adequate communication the manager's capacity to make informed decisions regarding purchases is reduced. Generally, the category managers make decisions about the quantity of produce required based on how much product is in the store (on shelves and in back), upcoming promotions, flyers, and predictions based on past or seasonal sales. Within a distribution center visited as part of the field study, communication between the quality assurance staff and the category managers was considered to be a factor in ensuring that product is moved efficiently with minimum waste.

While purchasing locally has a number of unique problems (to be addressed later in this section), the process of accepting produce into the Company's supply chain is the same as any other product. Therefore, it is useful to discuss the broad framework of the operations side of the produce business unit prior to discussing the particular issues associated with locally sourced foods.

How Produce Is Purchased, Evaluated, and Redistributed

For the Company, supply-chain organization and management are two of the key components of successfully purchasing, evaluating, and distributing fresh fruits and vegetables. There are numerous general challenges, including waste management, shipping problems, border crossings, tracking temperature, promotion timing, food safety, and inspections. Assuming that all of these issues can be managed effectively, the produce will reach the distribution center, be organized into shipping orders, repackaged, and processed for transport to the individual retail locations.

Supply chains are fluid processes that consist of a number of different components, from producers, vendors and carriers, to category managers, buyers, quality assurance specialists, unloaders and lumpers, pickers, and retail stores. While most people see the piles of produce in the grocery store, and maybe catch the occasional glimpse of the storage room in back, they typically do not consider the scale of the distribution centers and the issues involved in getting product to stores safely and in good condition.

Vendor relationships are a key process for organizing a supply chain. The Company prefers to manage a few large vendors as opposed to a number of smaller independent ones. For the vendor and company, this process offers certain advantages: the Company receives better pricing on volume, and the vendor can track shipments and stock more efficiently. Recently, the Company has been focusing on producing a "top vendors" program to increase volume with those it considers its best vendors and reducing or eliminating business with others. The criteria for best vendor include "best labels," "best varieties," and "best farms." By consolidating vendors, the Company also improves what it calls "over & above," a program in which if the Company makes its purchasing goals from a vendor, the vendor will pay the Company back 2 percent of the sales. The fewer vendors, the easier it is to make targets and receive the rebate.

The produce chain begins with an order from a buyer to a vendor. The buyers are responsible for purchasing product for the distribution center (DC) from the vendors. These orders are based on inventory levels in the DCs, as well as previous history, current marketing promotions, and purchase orders made by retail stores. Replenishing a DC is a combined effort among the store managers, buyers, vendors, and carriers. After the buyers make the purchase order, the vendors assemble the product on pallets to be loaded onto the carrier's vehicle. Assuming that the carrier arrives at the vendor's center on time, with no weather or traffic delays, the product can be loaded onto the truck. Here another set of issues begins. Depending on the product, the method for loading the truck can be different.

Key considerations for moving produce include air circulation, temperature control, safety, preventing the cargo from shifting in transit, and ensuring that the pallets used are compatible with the format used at the DC and are safe for loading and unloading. Proper loading of a truck at the vendor's end can dramatically reduce problems at the DC for a number of reasons. First, produce that is packaged properly maintains freshness and quality. Second, by properly loading a truck that is formatted for unloading at a particular DC, the produce will not have to be transferred to new

pallets or smaller packages, a process known as "lumping." Third, by securing the produce properly, there is less chance that the load will be rejected outright, prompting a claim to either the vendor or carrier, depending on how responsibility is established. Finally, properly positioning the product in the truck promotes air circulation, ensuring even cooling and temperature control.

Temperature is monitored throughout transit by a device called a TempTale, the use of which is highly contested by vendors and carriers because it can determine who is to blame for loss of product quality or the rejection of a load. The TempTale constantly records temperature in the truck digitally. The information is then downloaded at the DC onto a computer, and it is determined if there was any deviation from the appropriate temperature range during transport, which is why correct loading of product and positioning of the TempTale is a key component of the process. The quality-assurance staff then begin to examine the product for freshness, including criteria such as the Brix measurement (sugar content), rot, mold, and stage (i.e., the redness of tomatoes, greenness of bananas). Product specifications are constantly in flux, based on information gathered by technical specialists about what is happening in the various growing regions. For example, if a grape field in Argentina experiences too much rain, which is causing increased waste, the acceptable amount of waste might be increased for the DC. This allows quality-assurance staff to assess product quality accordingly and make adjustments when considering whether to accept or reject the load. The process through which product is accepted or rejected from the DC is designed to ensure that waste is minimized and claims are reduced.

For the Company, efficiency is promoted through this model because the loss of product through rot, or early ripening, is reduced and there are fewer complaints from the stores. If a store receives product from the DC that is too ripe or is rotting, it can file a claim to recover the cost of the product. While the DC is the customer of the vendor, the stores act as customers of the DC. This system allows for a chain of claims to be made, providing that enough information is captured to demonstrate that harm has been caused.

Starting with the DC, category managers and assistant category managers can make claims to their vendors and carriers if quality assurance or receiving staff demonstrates that the product does not meet specified requirements for the produce in question. However, there is a system that must be followed to determine against whom the grievance should be levelled. Starting at receiving, when the truck is backed in and the doors opened, the receiving staff may immediately notice certain issues that could affect the subject of a claim. When the doors open, the staff examine the load to see if it has shifted in transit, whether the TempTale has been placed properly, and the condition of the skids. If there are problems, pictures are taken as evidence to file a claim.

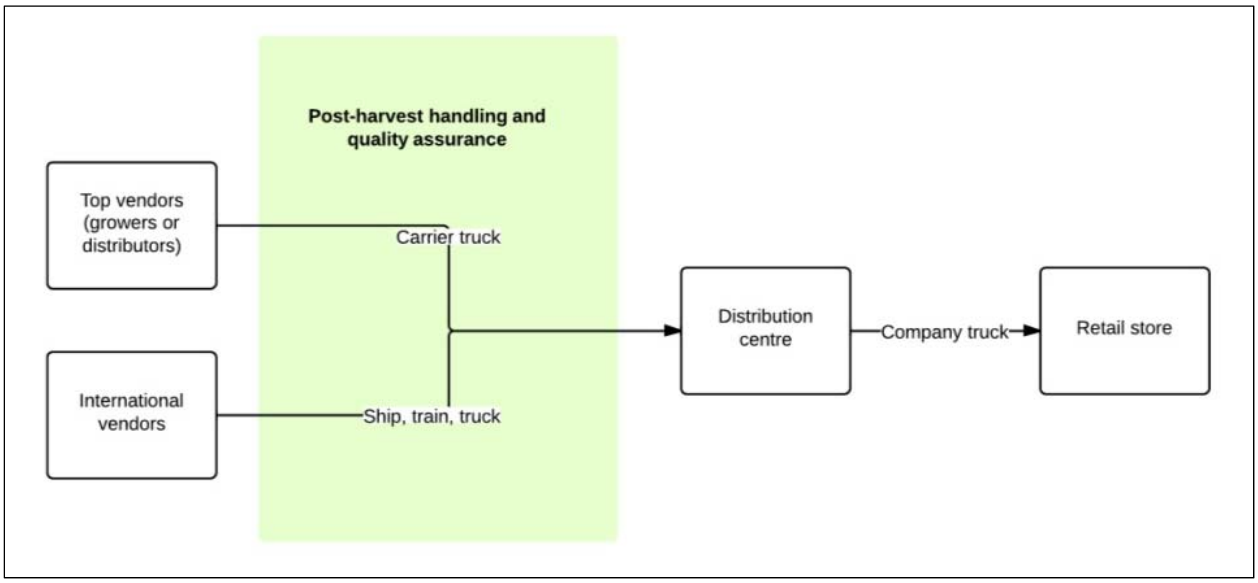
The typical supply chain for the Company is summarized in figure 1.

Locally Sourced Produce

Within this framework lies the local supply chain, which presents its own logistical problems. Local food can be problematic for the Company to process for two primary reasons. First, producers often do not have the ability to precool their fruits and vegetables with sophisticated and expensive field-chilling equipment, dramatically reducing shelf life. Second, because of the cooling issue, distribution channels must be reorganized to allow the local product to move swiftly through the supply chain in order to reach the retail store in peak condition. According to the Company, additional problems inherent in local food are inadequate information reaching the consumer, failing to time marketing to maximize sales, and mishandling of product through the supply chain. An additional consideration is the organization of business relationships.

The Company conditions for purchasing a product from a local producer are not currently very different from any other purchase, but how the product travels through the supply chain is very different. This process starts with an agreement between the local grower and the Company to provide a particular quantity of a product at a set price. Another method for acquiring locally grown produce is through a farmers' cooperative, which is often the only way smaller growers can access the

Figure 1. The Company's Existing Supply Chain



Company. This is because many local growers simply cannot provide enough product volume independently. Successfully integrating local produce in the dominant supply chain depends largely on communication, timing, and marketing (e.g., Bittner et al., 2011; Day-Farnsworth et al., 2009),

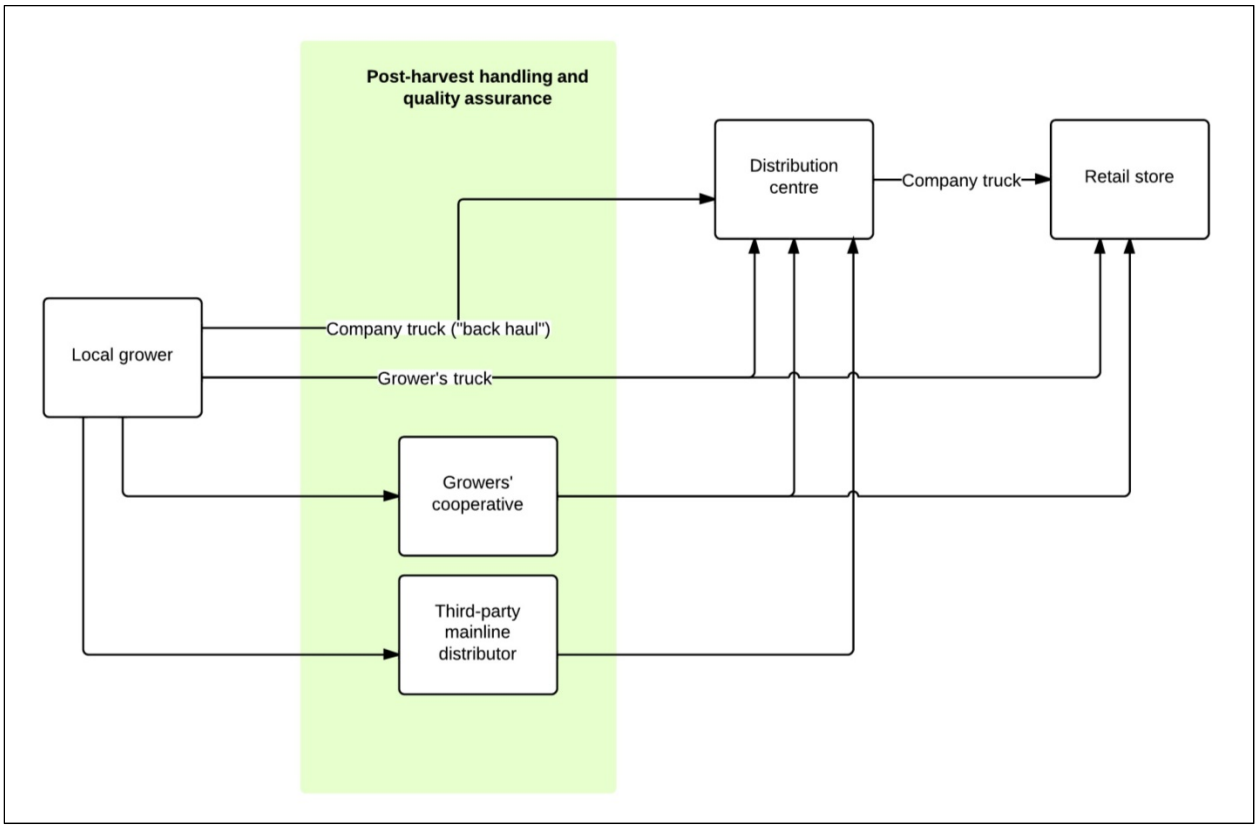
The Company purchases and organizes the transfer of local food through four primary mechanisms, which are coordinated between the Company and a vendor, or directly with the grower. The first option is the most simple and straightforward, but probably now rare. The grower delivers the product on his or her own truck from the farm to the distribution center. In this case, the order is filled through a web-based program, which allows the Company to create a purchase order (PO) that the growers see on their computer and thus can immediately fill. The second option is a "back haul." This process requires the Company to coordinate with the grower and one of the Company's transport trucks. The truck is always on its way back from a store delivery, and is rerouted to the grower to pick up the produce requested via the PO. In this instance the grower is charged a fee for the transportation costs of the haul. This is a preferred method for the Company because it allows keeping trucks full. Back haul has been identified in many cases as a significant challenge for innovative local distribution because immature and low volume local markets mean insufficient goods are available for back haul near delivery points (e.g., Bittner et al., 2011; Diamond & Barham, 2012).

The third and fourth methods rely on third parties to serve as go-betweens for the Company and grower. The transportation division of the Company hires a third-party transport company to coordinate pick-up from the grower and delivery to the DC. This final method is primarily used for delivery from a farmers' cooperative: the grower delivers product to a central location, which then consolidates individual deliveries into pallets to meet the PO of the Company and make one delivery to the DC. This allows smaller growers to access large corporate retailers. Such coops typically have three primary goals: to ensure consistent sales at fair prices, to provide storage and delivery of product to retailers, and to provide liability insurance for members. These preferred approaches for local distribution are summarized in figure 2.

Volume

In speaking with the logistics coordinator of the Company, a number of issues were identified as

Figure 2. Preferable Local Supply Chain



problematic for providing major grocery retailers with local product. On the grower side, the Company encounters issues primarily related to the lack of cooperation among local farmers and their reluctance to join a cooperative. Each farmer believes they have the capacity to handle sales and logistics on their own, and they believe that the stores should sell whatever they grow rather than only product that meets a specific set of criteria. In addition, growers are reluctant to work together because each believes in the superiority of their own product.[5] This leads farmers to try to sell privately and results in less product being aggregated for large retailers.

This lack of commitment to cooperation is double-sided. Large retailers have no problem making deals with local growers. However, before they sign a contract they need proof of commitment from the growers that they will provide the necessary volume of product. Growers, however, are reluctant to agree to pool their product in one place without an agreement from the retailers that they will purchase all of it. To this end, the Company logistics coordinator has suggested that the major obstacle to providing local food in supermarkets, at least for perishable product, is gathering the product of enough growers in one place so that large retail orders can be met.

The challenge of volume is compounded by the complexities of grading. Because the Company is made up of a number of subsidiaries, it arranges different grades of products and different sales prices for each type of store, from discount to high-end stores. Consequently, it orders different grades from different suppliers. Taste, sugar content levels, and product quality are consistent standards that are applied equally regardless of the destination of the product. Size is the primary determining factor for the grade and the type of

[5] Interpretation provided in an interview with the general manager of an Ontario fruit growers' cooperative.

store that will sell it. The farmer may not be able to guarantee the grade of the produce that will be grown; thus, the Company and the farmer might have various levels of price agreements set up prior to harvest. The Company generally needs to make deals with more growers in order to achieve the same volume received from international growers.

Seasonality

As with other produce, marketing campaigns are planned for seasonal products and their success depends on getting the product from the field to the stores at the time required. Unfortunately, growing seasons are rarely perfect and the product does not always arrive on time. Obviously farmers cannot control the weather or predict with 100 percent accuracy the quality grades of their crops, resulting in occasional delays in harvesting.

In these instances, alternate supplies are arranged ahead of time so that when the Company is notified that the local produce will be late, they can arrange for a back-up shipment. While this is a problem for both grower and supply-chain personnel, according to information received from the Company, the late product from the local vendor is always purchased when it is ready, at the same price agreed upon at the start, provided that the final product meets the same technical standards that were originally agreed to during negotiations. A similar policy is in place for international suppliers.

Cooling

While coordinating the marketing campaigns with the actual production and delivery of the produce is difficult, getting the product from the field to the store is even more difficult. The inability of local growers to precool their produce prior to shipping means that product immediately loses shelf life, and without being able to move local food quickly, the Company risks a serious loss of revenue. Precooling acts to remove the heat stored in the vegetables during their time in the field. By removing this heat and immediately bringing the temperature of the vegetables down to required specifications, shelf life is increased. This allows companies to take days to ship produce and facilitate transit to the stores. With local food that is not precooled, communication is the key to ensuring fresh produce moves from the field to the store in less than 48 hours. Communication between the carriers from the time they pick up the produce to reception at the DC allows the Company to deal with local, unchilled product immediately by delaying unloading precooled international product and prioritizing the local product. The chain of communication essentially needs to flow from the grower, to the carrier, to the category management team, to the receivers, to the assemblers, to the DC, and finally to the store managers.

Business Relationships

With these challenges in mind, building a business relationship with its vendors is a primary consideration for the Company due to the impact it can have on volume pricing, proximity to DCs, cost of transport, and production of speciality crops. A number of issues can be either harmful or beneficial to the grower. Depending on the location, volume of goods, and product grown, a grower may have more or less influence over negotiations with the Company, both on pricing and regarding the acceptance or rejection of product at the DC.[6]

First, the location of the grower is certainly a consideration for the Company because of the ease and speed of product transport to the DC. The closer the farm, the easier it is for the Company to call up a last-minute PO and organize a shipment through the DC to the stores. Additionally, the location of the grower dictates how many obstacles there may be for the Company. The further away the grower, the more complex the transport and logistics. The distance from field to DC not only affects freshness but also creates more chances for weather problems, border disputes, mechanical issues, temperature control issues, increased transport costs, and timing considerations. Growers closer to the DCs can exploit this advantage.

Second, the size of the farm and volume of

[6] It is worth noting that the Company logistics coordinator described large corporate retailers as more professional and easier to deal with for local growers than independent grocers, because larger retailers are more willing to pay a premium to have high-quality local product in their stores. In contrast, according to the coordinator, independent retailers constantly demand a lower price for the same quality.

production are considerations for the Company, because fewer growers mean a more streamlined logistics and purchasing process. In corporate terms, this means greater efficiency and lower costs.

Third, the uniqueness and quality of the product grown at the farm influence negotiations with the Company. With fewer local producers of a specific variety or crop, there is more competition between the large supermarket chains for that grower's business. In addition, if that grower can deliver a higher quality product, a higher price can be negotiated.

A senior member of the produce business unit revealed that the Company does take the occasional loss on a local product in order to attract more patrons to the store, hoping that increased purchases in other product categories associated with greater customer volume will compensate for losses associated with purchase of local produce. The benefit of local food, thus, is not necessarily profit, but how a high-quality product draws customers. Nevertheless, while the Company desires to increase its purchase of local food, it needs to see a net revenue increase over time. Without the prospect of profit in this category, the Company believes it would be hard to justify this program to its shareholders.

Discussion and Conclusions

To summarize, the Company is having difficulty advancing its localization efforts because the requirements of its current produce supply chain are not well suited to the distribution of local product. The value chain model advanced by Stevenson and Pirog (2008) is helpful for understanding why. Derived to meet the unique challenges of local food chains operating at a larger scale, value chains distinguish themselves through four core dimensions: differentiating value-added products; committing to the welfare, particularly financial, of all participants; creating strategic partnerships; and creating trust and shared governance (Bloom & Hinrichs, 2011). By incorporating these key dimensions, successful value chains are able to "operate at a larger scale than direct marketing while deliberately embedding mechanisms to ensure social, environmental and economic benefits for supply chain participants" (Bloom & Hinrichs, 2011, p. 14). Typically, such approaches are associated with midscale and regional food system actors, not major national ones, but we employ the framework here to shed light on challenges facing the Company.

Differentiating local product is particularly challenging for large retail operations that do not have personalized connections in the supply chain. In the Company's view, the success of a local food program, and the ability to purchase increasing quantities of locally grown fruits and vegetables, is largely based on the success of marketing campaigns; however, the promotion of local food at the level of large retail is complex. Scheduling the marketing of products is tricky for the Company due to certain limitations, such as lack of accurate knowledge of when the product will be harvested, little ability to predict product quality, and organizing the regional seasonal differences from one end of the country to another. During the local food season, dozens of products may be available in a relatively short period of time. Because of this, marketing managers must be aware of the potential volume of sales for each product, the price being paid to the producer, and which products they are willing to take a loss on or must make a profit on. Answers to these questions help the marketing department make an informed decision on advertising local produce. After selecting the appropriate products to advertise and brokering a deal with the producer, a timeframe for advertising is arranged based on the producers' predictions for harvest, past experiences, and research collected by the Company.

In general, the food industry has created expectations of constant availability, leaving consumers with the belief that the logistics of moving food around are relatively simple. Now, the Company needs to help consumers understand why local products are only available seasonally, and sometimes inconsistently within the season. The inconsistency is partly about volume, but also represents a structural disconnect between the realities of local growers and supply-chain logistics designed around globalization, including post-harvest handling, transport dynamics, and certain quality parameters.

Lack of strategic alliances and conditions of

trust also create impediments to increasing the volume of local produce available for large retailers. There are certain local products that the Company would like to purchase, but they are not grown in sufficient quantities to warrant distribution at the store level. In particular, Canadian-grown garlic and heirloom tomatoes are products in demand from the Company's customer base; however, because the local quantities are so small and spread out, the Company cannot justify the process of collecting and distributing them to stores. Many farmers are reluctant to switch to these crops because they fear it may not pay off, and retailers are typically unlikely to provide advance contracts to lower the investment risk. This also speaks to the willingness of the Company to assure the financial health of its suppliers. There is some supply-demand coordination going on, and the Company does claim to be paying higher prices, but local farmers likely carry most of the risks associated with losses. The Company does not appear to be willing to support its local grower base with field-chilling and reliable contracting. In this sense, they do not have strategic alliances with their local grower base and there is no shared governance. The reluctance of many growers to collaborate in cooperatives augments this problem.

Bloom and Hinrichs (2011) report on a distributor "interested in finding ways of securing consistent, reliable relationships with local producers in order to coordinate the supply chain dynamics between production and consumption" (p. 20). There are many things the Company could do if this were its purpose as well. Some firms, such as Gerber, are supporting their grower base more directly now to address this dilemma. They provide technical assistance and favorable contract terms to encourage growers to expand production to meet the specifications of the firm. They also work to aggregate supply and improve product quality. Supporting post-harvest handling with technical assistance and even shared infrastructure would be another valuable investment of the Company in its suppliers. The Company is already supporting family-owned meat suppliers on food safety problems, so having comparable initiatives for produce with post-harvest handling would be consistent with current directions. It would admittedly be challenging to transform supply-chain logistics so that the growers could distribute directly to stores, bypassing the DCs, to enhance the likelihood of suitable shelf life, but this would confront current approaches to food safety, product management, and food waste. It would thus appear that localization efforts will not be successful without new mechanisms to overcome these issues.

Comparing the Company's situation to the challenges reported for small to medium-sized retailers, its size, geographic reach, and market dominance appear to present augmented obstacles. Centralized warehousing and the sometimes convoluted movement of food within a region likely increase the gap between harvest and store purchase, with attendant losses of product quality and increased waste. Related to this impediment, a large retailer has the market clout to offload liability for food quality and safety issues onto less powerful local actors, which to some extent contradicts the relationship-building that characterizes many short supply chains. Smaller retailers may also have greater flexibility related to supply seasonality, as they frequently have a less brittle ordering and distribution infrastructure. Their customers may also be more accepting of seasonality relative to large retailers, many of whom have partially built their customer base with year-round access to previously seasonal foods. This case analysis also suggests that a more limited range of local products is likely to be available because of the higher minimum volumes required. A direct comparative study of retailer scale could shed more light on these preliminary conclusions.

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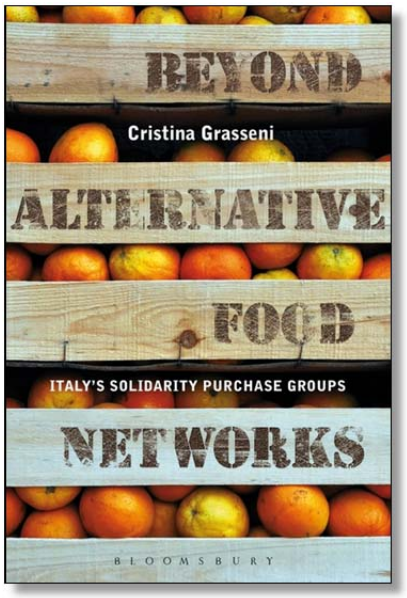
Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Leveraging social change through collective purchasing

Book review by Holly A. Chaille



Beyond Alternative Food Networks: Italy's Solidarity Purchase Groups

Grasseni, C. (2013). *Beyond alternative food networks: Italy's solidarity purchase groups.* New York: Bloomsbury. Available as hardcover, paperback, and EPUB and PDF eBook. Publisher's website: http://www.bloomsbury.com/us/beyond-alternative-food-networks-9780857852298/

Published online March 9, 2014

Citation: Chaille, H. A. (2014). Leveraging social change through collective purchasing [Book review of *Beyond Alternative Food Networks*]. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 177–178. http://dx.doi.org/10.5304/jafscd.2014.042.009

On the dedication page of *Beyond Alternative Food Networks,* Grasseni quotes from Immanuel Kant's *Critique of Pure Reason:* "There can be no doubt that all our knowledge begins with experience." Her selection may serve as an indicator that Grasseni's experience as a member of a solidarity purchase group (a group of people who purchase directly from growers and producers) is the basis for her argument that these community collaboratives can be powerful structures for addressing and improving more than local food issues. A conscientiously systematic and democratic approach that stresses inclusion as opposed to homogeneity, she posits, can be applied more broadly within communities to address economic sustainability.

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Grasseni's writing style reflects her strong research background; she takes care to explain that as a member of one such solidarity purchase group, the Gruppo di Acquisto Solidale (GAS) that she is highlighting, she is practicing "engaged anthropology," a theoretical term for participating in a process while observing it. In fact, her involvement as a *gasista* is critical to her research, making her an expert witness for her case.

Grasseni sets out to explain how the food provisioning models utilized in Italy are not merely food buying clubs or access points, but very promising transformative economic models. She argues that healthy GAS models empower their members to think of themselves as more than a collective of consumers. They develop the potential power to become change agents within their local regions, capable of affecting local supply and demand decisions in ways that prioritize people and the environment above cost.

The book is a fairly quick read, with only five chapters laid out in a scholarly manner, each complete with up-to date citations and notes that can take one further into the field, as it did this reader. There are also numerous notes, a glossary, footnotes, and a very thorough reference list.

Chapter 1 provides an overview of food networks across the globe, including the community supported agriculture (CSA) model common in the United States. A reader hoping to compare CSA and GAS models will learn that they are not all that similar, as CSAs emphasize a farmer-to-customer relationship, a facet of ethical consumerism, whereas a GAS by definition is reliant on the group relationship with the farmer or source of goods. This is an important distinction, as it would seem unlikely that the American habit of "looking out for number one" precludes us from the collective consumer behavior Grasseni describes as the basis for co-production, detailed further in chapters 2 and 3. This is not to imply that we here in the U.S. can't affect change singularly or work together as a group as a GAS does, but it is a point of departure and explains why there is not more discussion in this book of the CSA model.

Chapter 2 focuses on Italy's various food system strategies and begins to flesh out those characteristics of GAS that distinguish it from a collaborative effort — to rebuke habitual consumerism based on ease of acquisition — to a collective imagination and practice of evaluation, deliberation, and problem-solving, capable of reshaping and reprioritizing the local economy.

Chapters 3 and 4 describe the Gruppo di Acquisto Solidale in detail, allowing the reader to glimpse the structure and process from within. Citing specific examples from her experience as a gasista, Grasseni illustrates the alternately painstaking, mundane, and celebratory interactions required among members. These chapters could be construed as a warning to those not inclined to have face-to-face encounters or long meetings over Excel spreadsheets, but it is this due diligence that creates trust and reliability among members and is important in setting the stage for chapter 5, in which the author's thesis is examined.

Though she repeatedly argues that this type of collective capacity-building is useful in times of crisis, Grasseni's thesis is arguably more applicable when a community is not reeling from corruption or calamity.

In chapter 5 Grasseni cites several incidents in Italy's recent history, such as financial scandal and a well-publicized international horse-meat contamination, as the crisis points that gave GAS and similar networks the opportunity to develop. This seems to diminish her thesis, however, because it suggests that GAS are opportunistic and reactive, filling a need at a point of mistrust. Throughout the book Grasseni emphasizes transformation as a result of purposeful discernment. While it is certain that greed and unethical practices will make communities question leadership, the birth, growth, and sustainability of GAS, CSAs, or any other group of like-minded and willing members can affect great and permanent change at any point in time — and perhaps with greater success when approached with great deliberation and forethought.

Advocates of local food may find this book invigorating in its ability to articulate how food networks hold the promise of powerful movements from a grassroots level. Though this is not a book that depicts the CSA model Americans are familiar with, it does describe in detail several strategies currently used in Italy that could provide an adaptable model for the future of U.S. local food networks.

The author is not new to the subject of food networks, and her writing suggests her commitment to detailed research. A social anthropologist, Grasseni's CV includes fellowships at Radcliffe and Harvard, where she is currently a visiting scholar.

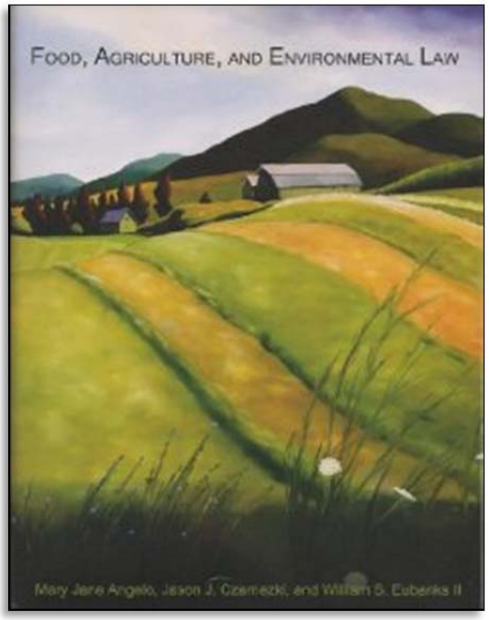
Grasseni challenges the reader to ponder a variety of questions she has come across in her studies, including whether a truly socialist network of citizens can change our current reliance on commodity-based, cheap, unsustainable food chains, or if we have gone too far in our destruction of the environment and our own willingness to sacrifice personal health to recover.

The book is written more for researchers, planners, and perhaps those food system planners who collect works related to the field. Not a how-to guide, *Beyond Alternative Food Networks* does more in the way of offering a philosophy of economics through a social-science lens.

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Exploring food, agricultural, and environmental law and policy reforms

Book review by Sheila Fleischhacker, National Institutes of Health



Food, Agriculture, and Environmental Law

Angelo, M. J., Czarnezki J. J., & Eubanks II, W. S. (2013). *Food, agriculture, and environmental law*. Washington, D.C.: Environmental Law Institute.

Published online February 10, 2014

Citation: Fleischhacker, S. (2014). Exploring food, agricultural, and environmental law and policy reforms [Book review of *Food, Agriculture, and Environmental Law*]. *Journal of Agriculture, Food Systems, and Community Development, 4*(2), 179–181. http://dx.doi.org/10.5304/jafscd.2014.042.003

Books have played an important role in shaping the United States' food, agricultural, and environmental systems. One of the most influential is a1906 book entitled *The Jungle* written by Upton Sinclair that used investigative reporting to descriptively portray the working and living conditions endured by immigrants working in American meatpacking factories. Sinclair horrified readers and stimulated public outrage that led to political pressure to enact the Meat Inspection Act and the Pure Food and Drug Act, as well as establish the U.S. Food and Drug Administration. Another influential book, *Silent Spring* (1962) by Rachel Carson, led to stronger pesticide regulations and launched the environmental movement. More recent examples include *Fast Food Nation: The Dark Side of the All-American Meal* by Eric Schlosser (2001) and a series of writings by Michael Pollen (e.g., *The Botany of Desire: A Plant's-Eye View of the World* (2001) and *The Omnivore's Dilemma: A Natural History of Four Meals* (2006)). Both authors raised

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awareness about the associations between an increasingly industrialized food supply and obesity.

These literary pieces provide unique, descriptive food systems insights; however, individually or collectively, they do not provide a systematic approach to understanding the complex and dynamic set of laws, regulations, policies, and procedures established under global, federal, tribal, state, and local authority governing our food, agricultural, and environmental systems. As advocacy mounts for various reforms and research advances our understanding of the multifaceted opportunities and challenges for our current and future food, agricultural, and environmental systems, a need exists for a transdisciplinary examination of the historical and contemporary legal and political developments influencing these systems.

In *Food, Agriculture, and Environment Law,* the editorial team of Mary Jane Angelo, Jason J. Czarnezki, and Williams S. Eubanks II coordinated more than 11 authors to examine a range of issues that were a part of past, present, and potentially future farm bills, as well as other influential global, federal, state, and local laws shaping food, agricultural, and environmental systems. Eighteen chapters tackle the policy and politics involved in the United States' evolving governing approach to ensuring safe, healthy, affordable, and sustainable food, agriculture, and environmental systems. One of the editors, William S. Eubanks II, starts the book by briefly explaining the history of U.S. agriculture and the emergence of the farm bill during the Great Depression, which he states was a "temporary fix to an urgent situation" for an economically depressed farming economy. His introduction provides facts and figures to illustrate declining trends in the number of farms and farmers in our country and the role of crop maximization in shaping American farm policy and rural America. Eubanks concludes by outlining the remaining chapters: components of the current farm bill (chapter 2); ecological impacts of modern farming (chapters 3–7), intersections between agriculture and existing environmental and related laws (chapters 8–13), and suggested reforms (chapters 14–18).

Chapter 2 sets the stage for the components of the current farm bill under debate, particularly key environmental provisions including farm commodity programs (Title I), conservation (Title II), energy (Title IX), and horticulture (Title X). The authors discuss how budget and trade constrain current and future farm bill considerations. Chapter 2, and the book as a whole, gave little attention to relevant domestic food and nutrition assistance components of the farm bill (Title IV), particularly the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps. Estimated to serve more than 45 million low-income individuals and families at a cost of about $80 billion a year (in US dollars), SNAP is a significant component of the farm bill and has been a contentious issue contributing to disagreement between the House and Senate. Nonetheless, the book covers relevant modern environmental aspects relating to the farm bill using very detailed examinations of the environmental impacts of industrial fertilizers and pesticides (chapter 3), agricultural irrigation (chapter 4), animal agriculture (chapter 5), genetically modified organisms (chapter 6), and food production, processing, packaging, and distribution (chapter 7).

In addition to examining the farm bill, several chapters (e.g., chapters 8–13 and 16) analyze pertinent agriculture and environment laws. For instance, chapter 8 points out shortcomings of the Federal Insecticide, Fungicide, and Rodenticide Act, which grants the U.S. Environmental Protection Agency the authority to regulate pesticides. Chapter 9 specifically points to gaps in the Clean Water Act's permitting program; as one example, the Act does not cover the majority of agricultural discharges. Likewise, chapter 10 explores the federal, regional, and state monitoring and enforcement regulatory gaps relevant to agricultural air pollutants. Another law examined is the Endangered Species Act (chapter 11), which does not exempt agricultural activities. The authors, nevertheless, point out how proving causation during prosecution and enforcement has limited this Act's ability to curb problematic agricultural practices. Chapters 12 and 13 cover a variety of food statutes including the Food Safety Modernization Act of 2010 and certain provisions of the Healthy, Hunger-Free Kids Act of 2010 that strive to

promote locally grown and raised foods. There is not much attention given to land use and zoning laws that aim to promote community gardens, farmers' markets, or mobile vending, nor to policies and programs incentivizing retail food outlets in underserved communities. Chapter 14, as one of the few exceptions, discusses the pros and cons of zoning agricultural use districts.

The concluding chapters generally suggest incremental but steady changes, recognizing budgetary and political constraints of major reforms. These changes include rewarding farmers for implementing sound ecological practices and providing nutritious products for consumers, and supporting research that more effectively examines the intersections between food, agriculture, and the environment. Other suggested reforms include exploring how dietary guidelines and food labeling can be mobilized to promote nutritious foods produced through sustainable agriculture practices. Throughout the book, the authors consistently emphasize the importance of creating comprehensive strategies and recommend that readers consider the individual approaches put forth in combination — not as isolated solutions — to developing more sustainable food, agricultural, and environmental systems.

Taken together, the 18 chapters tackle complex and dynamic food, agricultural, and environmental governing structures, providing both historical and contemporary illustrations. Several potential levers for reducing the environmental impacts of food and agricultural practices are examined and a number of short- and long-term reforms are explored in a style that is understandable and actionable for practitioners in the field. The book (or chapters of it) will likely be a useful tool for food, agricultural, and environmental law and policy courses, workshops, or professional or personal development pursuits. A stronger, more consistent editorial presence in future editions or an instructor's manual might facilitate meaningful classroom or book club discussions. Some curriculum-friendly examples could include discussing how the chapters work together; helping to compare and contrast viewpoints presented and, as needed, inserting conflicting views when not covered by the book; and supplementing a chapter(s) to provide additional historical and contemporary context with books such as *The Jungle,* media, reports, peer-reviewed research, or legislation including the long-awaited farm bill (Agriculture Act of 2014 signed into law by President Obama on February 7, 2014).