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Hoophouse Contributions to Farm Profitability and Food System Sustainability: Lessons from Michigan

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Abstract: This article discusses work in Michigan to test the contributions of hoophouses to farm profitability and food systems sustainability. On-farm enterprise budgets and farmer interviews reveal that hoophouses can earn profit for farmers producing fresh, locally grown produce throughout the year, but that production and marketing management are critical to success. A series of training and educational activities are underway, including efforts to create model business plans and familiarize agricultural lenders and professionals with this technology. Greater resources are needed to develop and implement train-the-trainer models, to ensure delivery of needed expertise with sufficient quality control guarantees.

Introduction

Hoophouses (also known as high tunnels) are passive solar greenhouses that extend the season for vegetables and permit year round harvesting (Blomgren, Frisch, & Moore, 2007). They are a critical tool for addressing demand for locally grown foods and enhancing opportunity for farm revenue in places with limited growing

seasons like Michigan. Their use in four-season vegetable production was pioneered by Maine's Eliot Coleman. Many land-grant universities conduct research and provide resources and support for their use (Campbell, 2008; College of Agricultural Sciences at Penn State University, 2003; Middendorf, 2007; Montri, 2010; Williams, n.d.). Hoophouses have many applications beyond traditional vegetable farms: school gardens, providing living science labs when school is in session, as well urban, community and home gardens.

The use of hoophouses in Michigan was promoted by John Biernbaum based on 2 years of winter salad greens research (2001-2003) and development of the Michigan State University Student Organic Farm, which began using hoophouses, field production, and cold storage to supply a 48-week Community Supported Agriculture program beginning in 2003. Hoophouses' efficacy in this setting led to a USDA CSREES integrated project from 2006 to 2009, in which their contributions to farm and food system sustainability were tested on nine Michigan farms. Participating farmers received a hoophouse at no monetary cost in exchange for 30 months of economic data and use as a demonstration site.

Research Questions, Methods, and Results

The project researched four major questions and associated methods:

- "Do hoophouses make money for farmers?" was measured by a series of nine on-farm enterprise budgets.
- "Will consumers buy local produce at extended season farmers markets?" was measured using dot poster and written surveys, focus group and experimental auctions at three farmers markets used by participating farmers.
- A series of three interviews was used to answer "What are farmers' experiences adopting this tool?"
- An embedded energy comparison was used to measure "Are there environmental benefits to their use?"

The major results include:

- Given good management and markets, hoophouses can increase farm revenue, but participating farmers experience a wide range of economic outcomes (Table 1).
- Consumers clearly expressed willingness to attend farmers markets year round and pay premium prices for fresh local produce (Conner, Montri, Montri, & Hamm, 2009).
- Farmers experienced a learning curve while adjusting to growing indoors with high-intensity succession cropping, but were able to grow high-quality produce, which many believe attracted customers to their stalls where they continued to buy other items from the farmers throughout the season. Careful record keeping was associated with higher profits.

- Growing salad greens in Michigan hoophouses uses less energy over time than importing these items from Arizona in winter months.

Table 1.
Revenues, Costs and Effective Wages of Participating Farmers at the Conclusion of the Study

Farmer Number	Gross Revenue	Costs	Net Revenue	Labor Effort (Hours)	Effective Wage (Net revenue per hour of labor, $/hour)
1	$8893	$2968	$5925	3075	$1.93
2	$6270	$3203	$3067	371	$8.27
3	$5600	$3006	$2594	328	$7.91
4	$20193	$3420	$16773	902	$18.60
5	$6963	$1438	$5525	752	$7.35
6	$2401	$2050	$351	1241	$0.28
7	$4415	$2237	$2178	420	$5.19
8	$9122	$4857	$4265	1465	$2.91
9	$18897	$3638	$15259	1591	$9.59
Average	**$9195**	**$2980**	**$6215**	**1127**	**$6.89**

Outreach and Education Efforts

The USDA project was integrated, combining research with outreach and education. Original project funds were used to hire Adam Montri, who continues to serve as the coordinator for hoophouse outreach activities. Montri has created a series of planting guides and instructional videos, and blogs regularly about tips and lessons learned <www.hoophouse.msu.edu>. He and Biernbaum have conducted over 100 workshops, tours, and conference sessions since 2006. To date, at least 40 farms have adopted hoophouses under their guidance. Montri and Biernbaum have also developed both on-line and in-person, for-credit courses in hoophouse production.

Plans for Future

Three follow-up projects are planned or underway. First, data from the participating Michigan farmers and university-based enterprise budgets for hoophouses are being used to create model business plans that highlight marketing and management plans and provide sample financial data that prospective farmers can take to lenders. These plans will also contribute to a SARE PDP-funded project to familiarize agricultural lenders (including USDA Farm Service Agency) with the capabilities and financial performance of hoophouses, as well as educating agricultural professionals (USDA employees, Extension professionals, and others) on the basics of hoophouse design, construction, and implementation. Surveys are underway to quantify the number of hoophouses operating in Michigan, estimate future demand for hoophouses, and project production capacity and market requirements.

Lessons and Implications for Extension Educators

Hoophouses work. They allow year-round production and farm revenue, yet economic outcomes on the nine farms varied widely due to differences in production and marketing management. By assisting would-be hoophouse users to create business plans for this enterprise, Extension educators can help ensure farmers have devoted sufficient resources and have researched and developed proper market strategies.

Demand for hoophouse training far outstrips supply. Montri and Biernbaum receive many more requests to conduct workshops, trainings, and consultations than they can accommodate. Stakeholders clearly prefer in-person training to planting guides and Web-based courses; however, clearly some farmers, particularly young farmers, are interested and use Web-based materials. Greater resources are needed to develop and implement train-the-trainer models, to ensure delivery of needed expertise with sufficient quality control guarantees.

Conclusions

Our project was conceived as a test of *technology*, but the results soon convinced us that the key to success was *human*, namely farm management. This result reinforces the opportunity for Extension educators to provide technical assistance in production, marketing, and business planning, as well as connecting farmers to peers, researchers, and other professionals to facilitate knowledge creation and exchange. Given the potential benefits of hoophouses to farm viability, access to healthy locally grown fresh produce, and overall food system sustainability, we hope our work will inspire greater interest on the part of Extension professionals.

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