Extension Bulletin 3138 • New • December 2010

Hoophouse Farming Startup:

Economics, Efforts and Experiences from 12 Novice Hoophouse Farmers

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Executive highlights

Twelve farmers were provided 30- by 96-–foot hoophouses valued at approximately $10,000 (in 2006) in exchange for maintaining records of expenditures, activities and overall sales for 30 months. The farm-to-farm results varied as much as tenfold for some variables measured. Total person hours for construction across all 12 houses averaged 237 hours with a range of 114 to 420 hours. In general, income peaked in April through June, with costs peaking two to three months earlier. Average peak monthly profits in May ranged from $800 to $1,000. From October to February, profits were under $250 per month. Time spent on activities can be generalized as one third each on planting-related activities, harvesting and marketing activities, and crop and structure maintenance activities. Primary input costs not counting labor were fertility (19 percent), seeds (24 percent), transplants (14 percent), equipment (18 percent) and other (25 percent). Effective hourly wages averaged $9.29, with a high of $23.87. The payback period, based on allocating 100 percent of income to structure cost, averaged 5.75 years and ranged from 1.2 to 12.3 years.

Introduction

This is a report from one component of the research project "Season Extension for Small and Medium Scale Farms."[1] The project characterized the economics, efforts and experiences of 12 novice hoophouse farmers during the first three years of startup. The project did not characterize the potential or practices of experienced hoophouse farmers. This document is a report of the farmer experiences with hoophouse farming and is intended to be a resource for Extension educators and people interested in hoophouse management and profitability. The findings are presented below. Specific research methods can be found in papers referenced.

[1] This research was funded by the National Research Initiative of the USDA Cooperative State Research, Education and Extension Service (CSREES) and Michigan State University's Project GREEEN (Generating Research and Extension to meet Economic and Environmental Needs) grant number 2006-55618-16922

Project GREEEN

STUDENT ORGANIC FARM
Michigan State University

the c.s. mott group
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What are hoophouses?

Hoophouses, also known as high tunnels, are passive solar greenhouses that extend the production season for warm- and cool-season crops and permit winter harvesting of cold-tolerant vegetables. They are a critical tool for addressing demand for locally grown foods and enhancing farm revenue in places with a limited growing season, such as Michigan. Most tools allow farmers to farm more area, but a hoophouse allows farmers to farm more time.

John Biernbaum, MSU professor of horticulture, catalyzed the use of hoophouses in Michigan through extensive production research beginning in 2001. From this emerged the MSU Student Organic Farm (SOF) in 2003, which uses hoophouses, field production and cold storage to supply a 48-week community-supported agriculture (CSA) program. As of 2010, the SOF had nine hoophouses totaling over half an acre. Adam Montri, outreach specialist, was hired in 2006 to coordinate SOF hoophouse outreach activities. Montri has created a series of planting guides and instructional videos, and he blogs regularly about hoophouse tips and lessons learned.[2] He and Biernbaum have conducted more than 100 workshops, tours and conference sessions for more than 2,000 farmers and others since 2006. As of fall 2010, at least 40 farms had adopted hoophouses under their guidance. Biernbaum also developed both classroom and online credit courses in hoophouse production.

What was this project?

Twelve farmers, three from each of four regions in Michigan, participated in the project. Nine initial farmers were selected in 2006 with assistance of three community partners: a Michigan State University (MSU) Extension educator from southeastern Michigan; an MSU county Extension director in the eastern Upper Peninsula of Michigan and the founder of a farmers' market in western Michigan. Each community partner was asked to select and invite three area farmers to participate in the project. They were to be farmers who marketed primarily at farmers' markets so that evaluation of the extended season production on the farmers' market activity could be considered. With funds from the Michigan Agricultural Experiment Station, three additional farmers were selected in 2007 through a request for proposal process in the Traverse City area. The marketing focus of these farms was primarily on-farm. Once the farmers were selected and confirmed, the MSU team contacted farmers to arrange for delivery of the hoophouses and to schedule training sessions. The general locations of the four clusters of hoophouses are illustrated in Figure 1.

[2] www.hoophouse.msu.edu.

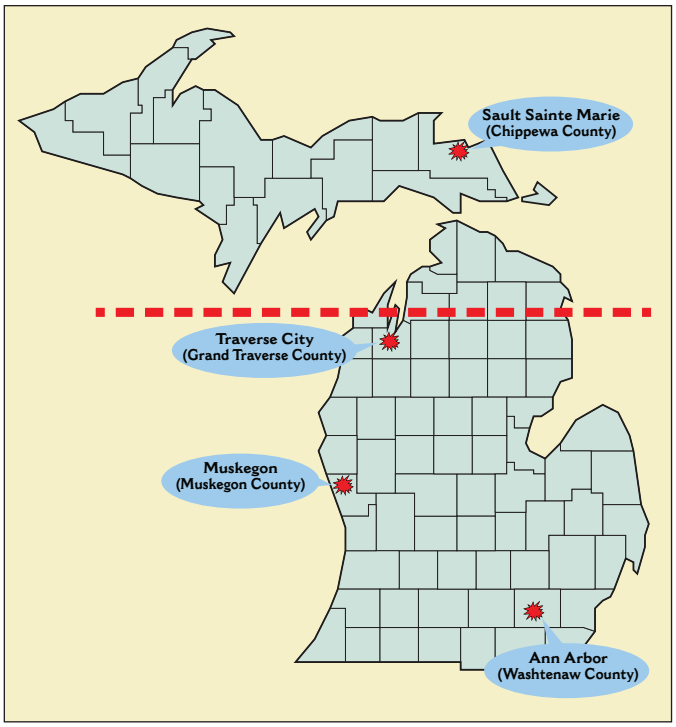


Figure 1. Hoophouse cluster locations.

What were the research questions?

The focus of the project was on the economics and management of hoophouses by novice hoophouse farmers. With data provided by the farmers, we compiled enterprise budgets for each of the 12 hoophouses to characterize the expenses and gross and net income. The enterprise budgets allowed calculation of the returns to owner-operator and family labor in each hoophouse. We wanted to know, given these net revenues, about how long would it take for the case study farmers to earn enough to cover the cost of building a hoophouse like the ones they had received. We also recorded data on construction of the 12 hoophouses to see how long it took to construct them. The farmers also collected data that allowed a summary of what they were spending money on, what activities they were doing in the hoophouses and how they were allocating their time. We also used a series of three interviews to learn about farmers' experiences in adopting this tool. The original intent was to compare the effect of crop selection and scheduling on profitability of specific crops — for example, tomato compared with lettuce — but farmers in the project were unwilling to record data at that level.

Who were the farmers?

A summary of participating farmer demographics, experience, farm size and location is presented in Table 1. Numbers have been assigned to each of the 12 farmers (F1 through F12).

ID	Age	Education (years)	Farm experience (years)	Greenhouse experience (years)	Total farmed (acres)	Vegetable farmed (acres)	County (Mich.)	Median income per county
F1	38	12	8	0	2	2	Chippewa	$41,173
F2	34	12	20	0	30	1.5	Oceana	$40,872
F3	49	16	25	14	200	80	Washtenaw	$59,126
F4	19	14	5	5	200	80	Washtenaw	$59,126
F5	51	12	2	0	45	0.25	Chippewa	$41,173
F6	55	14	3	0	1	0.25	Benzie	$45,309
F7	58	13	38	3	0.5	0.5	Muskegon	$41,274
F8	57	12	15	15	5	5	Newaygo	$44,157
F9	47	18	27	7	0.25	0.25	Mackinac	$37,928
F10	69	13	15	0	1.25	0	Washtenaw	$59,126
F11	33	14	15	1	80	18	Emmet	$50,566
F12	28	18	13	13	7	2.5	Leelanau	$56,056
Avg.	46.36	13.64	15.73	4.09	51.36	17.07	—	$47,257.27
S.D.	14.19	1.91	11.20	5.66	77.68	31.55	—	$8,274.05
Min	19	12	2	0	0.25	0	—	$37,928

Table 1. Summary statistics of participating farmers.

Farmers varied widely in age (ranging from 19 years to 69 years, with an average of 47 years) and level of education (ranging from general equivalence diploma to master of science degree). Everyone in the group had some farm experience, but only seven out of the 12 farmers had grown in greenhouses before. Two farmers had very large vegetable farms and sent vendors to many farmers' markets; the majority cultivated less than 2 acres of vegetable crops on outdoor acreage and sold at only one farmers' market. The median household income per county where hoophouses were located ranged from about $40,000 to $60,000 per year.

What hoophouses were used?

Each farmer received a 30-foot-wide by 96-foot-long hoophouse (Nor'easter, from Rimol Greenhouse Systems, Hooksett, N.H.), provided through grant funds, which was constructed on his, her farm. This hoophouse was selected for longevity and ability to withstand high snow load and wind expected at the sites.[3] It consists of 1.9-inch-diameter rafters on 4-foot spacing with trusses on each rafter, extended ground posts, double-layer inflated 6-mil polyethylene covering, 6-mil single-layer polyethylene on metal framed endwalls, wood hipboards and baseboards, manual roll-up sides and thermostatically controlled 51-inch-square louvered vents at the gabled peak ends.

[3] MSU does not endorse any particular type of hoophouse.

Extended 6-foot ground posts provided a sidewall height of approximately 7 feet at 1 foot in from the edge (2-foot ground post and 4-foot roof bow), which allowed aisles to be located on the edges of the structure, where it is coldest in the winter. In addition, electrical metal tubing (EMT) conduit was provided to construct a support frame for an interior crop covering (4-mil polyethylene), which facilitates increased temperatures in Michigan winters. The materials for this particular structure cost about $10,000 (2006). Hoophouses of many sizes and price ranges are available.

What was the process?

At each site, Extension educators and the other two project farmers from that region helped in the construction of each hoophouse. Biernbaum and Montri provided construction support at the designated demonstration site at each location. The farmers also had the opportunity to call and e-mail Montri for technical assistance in the form of conversation, pictures and site visits, as necessary. In exchange for the structure (which stayed on the farm after the study), farmers agreed to record and report all revenues, costs and labor hours associated with hoophouse growing. Farmers also agreed to participate in annual interviews describing their experiences, lessons learned and challenges.

Farmer collaborators were provided with necessary materials and tools to create records of daily practices. Farmers were

asked to submit monthly reports containing total revenue, labor by activity (e.g., planting, weeding, harvesting, packing, etc.) and costs by category (e.g., seeds, fertility inputs, packing supplies, etc.). Any revenues, costs, labor or other data from elsewhere on or off the farm were not considered. Second, because the hoophouses were placed on existing farms, fixed and equipment costs (land, taxes, tractors, additional buildings, etc.) were not considered unless they were specifically purchased for the hoophouse. The farmers were asked to judge whether they would have purchased a specific item, (e.g., a seeder) had they not acquired the hoophouse.

The first month of planting varied from August 2006 to March 2008 (Figure 2). Technical assistance was provided to farmers in the form of a sample seed order, schedules for year-round production in hoophouses based on actual planting dates generated at the MSU Student Organic Farm and course pack materials from MSU, which included supplemental articles. Technical assistance was also provided by telephone, e-mail and site visits. Farmers were provided with contact information for each of the other farmers in the project so that they could interact with one another. Each farmer chose his/her crop mix

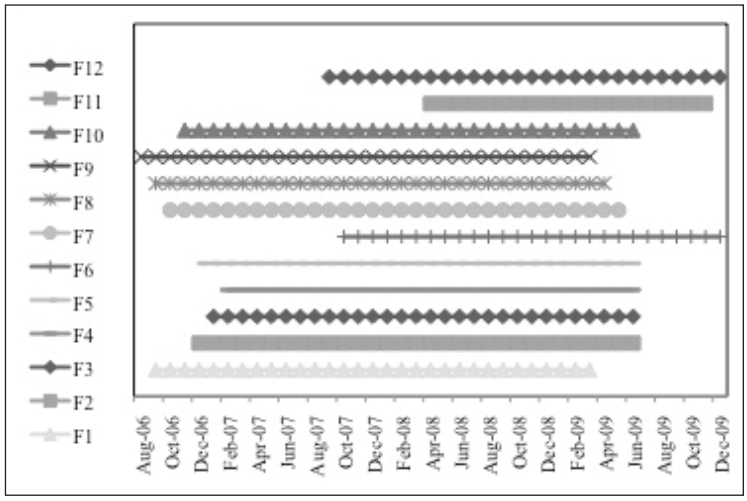


Figure 2. Range of months for which each of 12 participating farmers reported revenue, cost and labor data associated with growing in hoophouses as part of the Michigan State University-led study.

and crop space allocation; the researchers believed that part of the learning process was determining which crops best suited the farms' marketing goals and when and how farmers would use the hoophouse. All farmers used the structure to grow a variety of horticultural crops. Crops varied according to season, markets and customer preferences.

How long did it take to put up a hoophouse?

We tracked construction labor data for total person labor hours as well as labor hours for each site preparation, frame assembly, polyethylene covering attachment and other activities, such as electric and water installation. The Rimol construction manual for this size and model suggests approximately 100 total person hours are required for expert-level construction. Total person hours for construction across all 12 averaged 237 hours, with a range of 114 to 420 hours (Figure 3). Site preparation ranged from zero, for a structure built over a field already in production, to 134 hours, with a mean of 47 hours. Frame construction ranged from 91 to 228 hours, with a mean of 136 hours. Polyethylene attachment, which included two layers on the roof and a single sheet on each end wall, ranged from 10 to 97 hours, with a mean of 47 person hours. Other labor hours, which included providing water and electric service to the site in some cases, ranged from 0 to 23 hours, with a mean of six person hours.[4]

The building processs became more efficient over time and also varied depending on soil conditions. The first training build took 420 total hours, partly because of a heavy clay subsoil that slowed ground post placement.

What is the income time line?

Farmers recorded revenues and costs each month in a logbook. An example of farmer F2's revenues and costs (negative values) through the project is presented in Figure 4, which includes minimal expenses for hired labor during harvest. The magnitude of revenues far exceeds costs for this farmer. Also, farmer revenue from the first (2007) to the second planting season (2008) nearly doubled.

Averages of accounting profits, calculated as total gross sales or revenues from all hoophouse crops less costs consisting of the following categories: fertility, seeds, transplants, equipment, pest control, mulch, packing, marketing and labor) were calculated for the 12 farmers on the basis of submitted data. Costs are accrued immediately; revenues are realized approximately two to three months later, when the crop is harvested. Each month's cash revenues less costs comprises the residual cash flow per month. A graph of average residual cash flow is presented in Figure 5.

[4] It should be noted that some construction activities — such as covering and installing end vents, ribs and purlin — require more than one person.

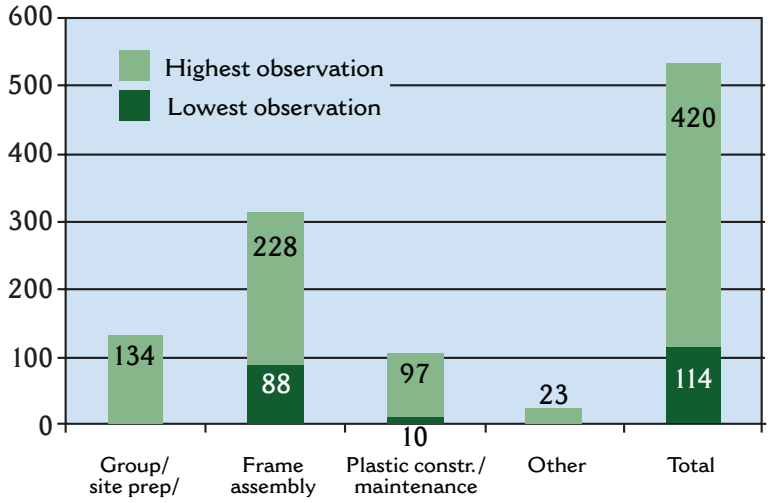


Figure 3. Minimum and maximum person hours required to construct hoophouses.

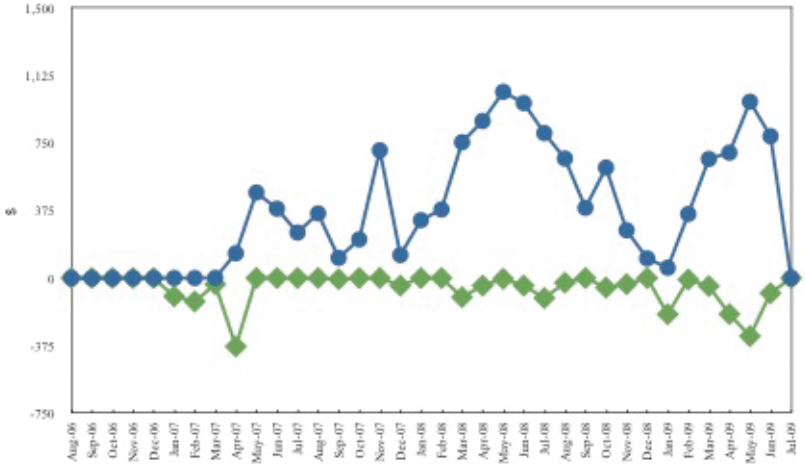


Figure 4. Farmer F2 revenues (blue circle/positive) and costs (green diamond/negative) over time.

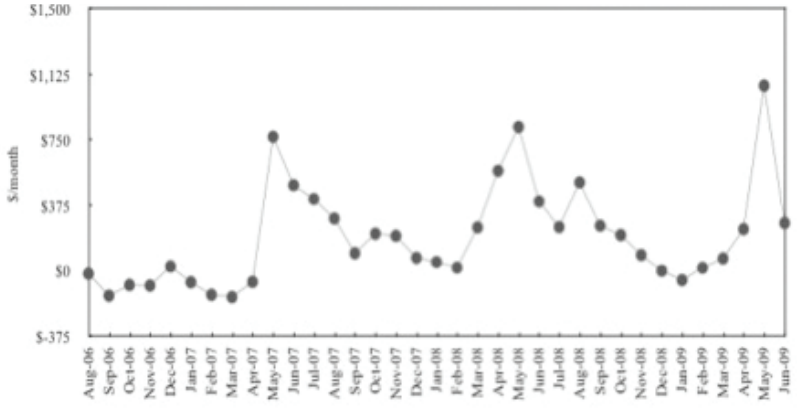


Figure 5. Average residual cash flow (or profit excluding the value of on-farm labor).

The average figures at any point in time, however, do not illustrate the learning curve and the changing profit over time because farmers received the hoophouses and started growing at different times — between August 2006 and March 2008 — so different stages of development are represented among the 12 farms in any given month. For this reason, the learning curve is distorted in the above figures as some new farmers begin growing while other farmers are making gains from learning.

Figure 6 shows the coefficients from a regression analysis that controlled for different start times of each hoophouse and the effect of farmers learning to use the hoophouse. It also isolated the statistical effect that can be attributed to each individual farmer (since some farmers are more profitable than others). The figure shows the amount ($/month) that can be statistically attributed to each month with respect to the dropped month, January, which is close to 0 on average. The data form a profile of how farmers used their time across the year. The estimates are slightly lower than they would be if we were able to simply average the data. Farmers' residual cash flow profile peaks in May and then slowly declines over the summer months until a small bump in profits in the late summer/early fall as a result of the second crop's harvest.

Farmers are able to use the hoophouses to get a jump on the outdoor growing season and see their largest profits in May. During the summer months, the profits drop back down to about half of the peak, and then there is a small bump at the end of the summer before profits go down to a much lower level in the fall/ early winter. For these farmers, minimal profits are made in October through March. Though the hoophouses were used to some extent in the winter months, these farmers primarily used the hoophouses for season extension and did not have a focus on winter harvesting. Winter harvesting requires a change in mindset, a willingness and ability to work in the winter months, and experience with winter growing. It also requires access to year-round farmers' markets or other winter markets. Winter harvesting is expected to change the income and profit pattern and provide more winter income, but whether that is true or how much of a change it would bring remains to be tested in future research.

[5] Note that the minimum hours required for ground site preparation and "other" were zero.

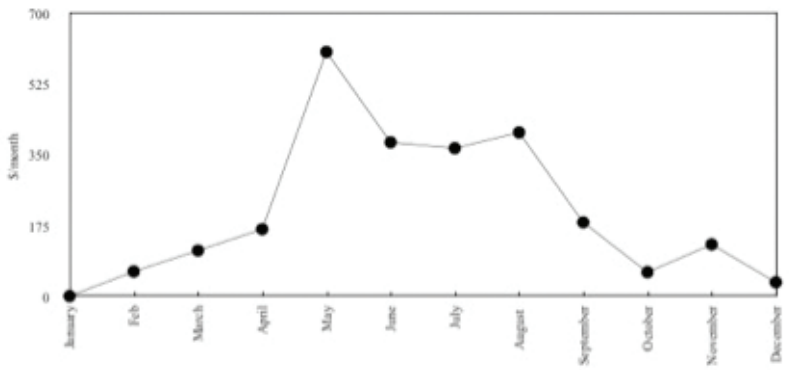


Figure 6. Profile of residual cash flow.

The hoophouses in northern Michigan may not be able to maintain the winter harvest that is possible in East Lansing at the SOF because of lower light and/or temperature conditions.

Experienced hoophouse growers have suggested minimum gross sales of $5 per square foot per year. These projections may be more readily possible for an experienced grower in established markets but less attainable during the few first years for those new to year-round production. The nine farmers who sold at farmers markets averaged $1.60 per square foot per year (average monthly gross income times 12 divided by 2,880 square feet), with the highest earner grossing $3.09 per square foot per year and the lowest approximately one tenth of that.

Was there a learning curve?

One way to see if there was a learning curve is to compare year 1 and year 2 data to see how farmers used the hoophouses differently in the second year than in the first (Figure 7).

In year 2, farmers invested more labor (more than double) in February and March as well as again in August and September to prepare for growing in the fall. In year 2, they also invested less time in the hoophouses during the height of the summer (in June and July) and later in October and December. Farmers seem to be focusing on the lead spring shoulder but not doing much with the end of summer/early fall sowing, so they are not maximizing the November to March harvest potential as demonstrated and recommended in the planting schedules from the MSU Student Organic Farm.

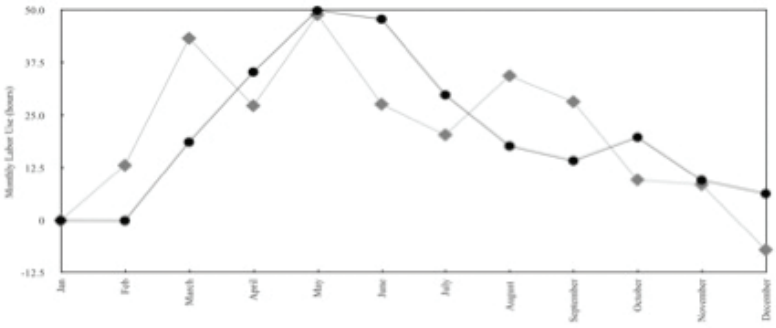


Figure 7. Monthly labor use in year 1 (black circle) and year 2 (gray square).

Effective Wages

End-of-study totals were calculated on the basis of the reported revenues, costs and labor hours (Table 2). Total profit was calculated by subtracting total reported costs from gross sales. The total costs include expenses for hired labor but not the value of on-farm labor. Effective wage was calculated by dividing the total profit column by total labor, which is only the on-farm labor hours reported.[6]

Table 2. Summary statistics of all 12 hoophouse farmers over the study period.

	Gross sales (revenues) (US$)	Total costs (US$)	Total profit (US$)	Total labor (hours)	Effective wage ($/hr)
F1	$8,892.50	$2,967.00	$5,925.50	3,074.5	$1.93
F2	$20,320.09	$3,420.80	$16,899.29	1,207.8	$13.99
F3	$6,269.60	$3,202.42	$3,067.18	264.4	$11.60
F4	$5,600.40	$3,005.84	$2,594.56	327.5	$7.92
F5	$6,963.16	$1,482.70	$5,480.46	752.3	$7.28
F6	$22,256.25	$7,056.20	$15,200.05	1,807.5	$8.41
F7	$2,400.00	$2,049.95	$350.05	1,241.3	$0.28
F8	$4,414.25	$2,237.51	$2,176.74	420.1	$5.18
F9	$9,122.01	$4,856.75	$4,265.26	1,315.3	$3.24
F10	$18,897.00	$3,638.20	$15,258.80	1,590.9	$9.59
F11	$14,887.91	$5,675.49	$9,212.42	508.0	$18.13
F12	$17,398.15	$5,983.09	$11,415.06	646.8	$23.87
Average	$11,451.78	$3,798.00	$7,653.78	1096.4	$9.29
SD	$6,893.09	$1,724.91	$5,768.30	806.3	$6.83
Minimum	$2,400.00	$1,482.70	$350.05	264.4	$0.28
Maximum	$22,256.25	$7,056.20	$16,899.29	3,074.5	$23.87

Extremely wide variation occurred among the 12 farmers, with almost half (five) effectively paying him- or herself less than minimum wage. The other seven farmers made more — one nearly $24/hour (Figure 8).

[6] Note that the exact number of months that each farmer was recording data (approximately 30) in the hoophouse differs, so sales and costs are not as easily comparable as the effective wage here.

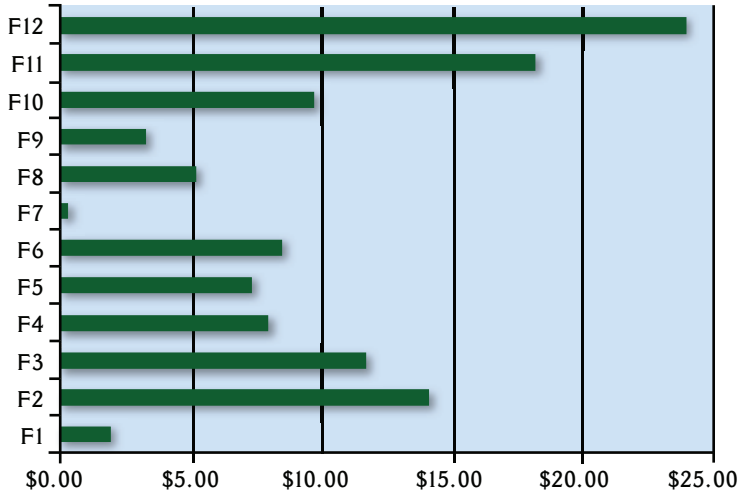


Figure 8. Effective wage comparison among all farmers.

The wide variation is apparent when we compare farmers F2 and F6, who reported the highest total gross sales. F6, however, reported costs twice as high as F2 did and also reported considerably more labor hours used. So Farmer F6's calculated effective wage was only about one half of F2's calculated effective wage. F12, who had the highest effective wage over the 30-month period, had relatively lower profits (lower revenues and higher costs) but very low labor hours. F11 had similar costs as F12 but generated lower revenues and ultimately had an effective wage that was significantly less than F12's. It also should be noted that farmer F7 had revenues almost equal to costs, both very low, demonstrating minimal effort overall, and thus an effective wage that was almost zero.[7] Farmer F1 put in so much labor (more than 3,000 labor hours over the course of the study, almost 10 times that reported by farmers F3 and F4) that the effective wage was also extremely low.

How long would it take to pay for a hoophouse?

As discussed above, the cost of the hoophouses used in this study was about $10,000 each in 2006. We calculated the average monthly net income for each farmer, omitting F7 as an outlier because it would take approximately 75 years to pay back the structure cost. These data are monthly averages from the first two years of recorded data from each farmer to account for the different times of year that farmers started growing in the hoophouses. This estimate of the payback period for the hoophouses takes into account only the cost of the structure, not the labor expensed for construction. Keeping the structures simple so they can be built with on-farm labor is a key to economic success.

Figure 9 illustrates that many of the hoophouse farmers would take more than seven years to generate enough net returns to pay for the structure. Some of the farmers, however, could almost pay back the $10,000 structure in a single year if you look at their income during the second or third year. Some farmers (F2, F6, F12) made more than $10,000 in their second year alone. So, potentially, someone buying a new structure who had experience with managing and growing in a hoophouse could net more than $10,000 in a single year. However, it is more reasonable for a beginning hoophouse farmer to expect a minimum of two years to be able to pay back the structure.

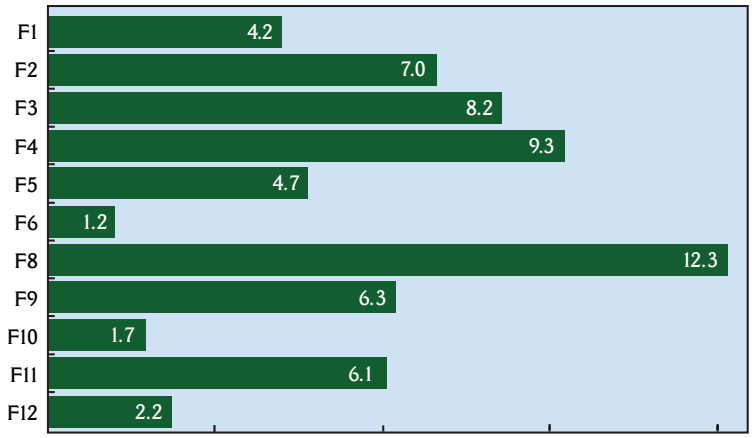


Figure 9. Time (in years) to pay for the hoophouses based on the first 24 months of net returns.

How did farmers spend time for hoophouse growing?

What activities did these 12 farmers spend their time doing in the hoophouses? The percentage of each farmer's total labor spent in each labor category is presented in Figure 10. For example, farmer F6 used almost 75 percent of total labor on bed preparation. Comparing this with Table 2 illustrates that the highest wage earners (F2, F11, F12) put most of their labor into harvesting and very little into bed preparation. A clear recommendation at the start of the planning for the research (February 2006) was to cultivate the site and add compost or grow green manures to prepare the site before the delivery of the hoophouses in July. Where this was not done and bed preparation was done by hand after construction, bed preparation time increased.

[7] This outlier faced problems not related to the hoophouse that prevented the farmer from having time for the hoophouse.

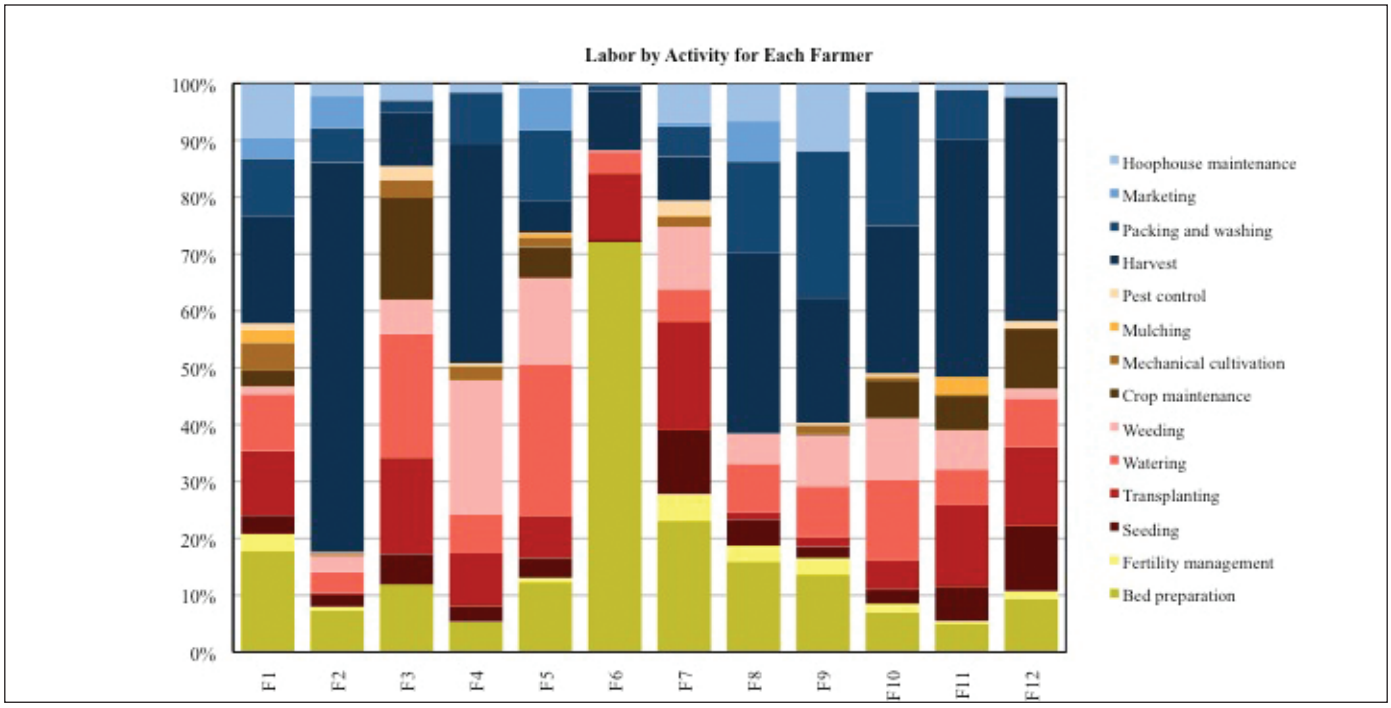


Figure 10. Labor use by activity as percentage of total labor use for each farmer.

Figure 11 illustrates the total labor use across all the farmers in each labor category, measured in person hours. It is clear that, overall, harvesting and bed preparation are where farmers invested the majority of their time.

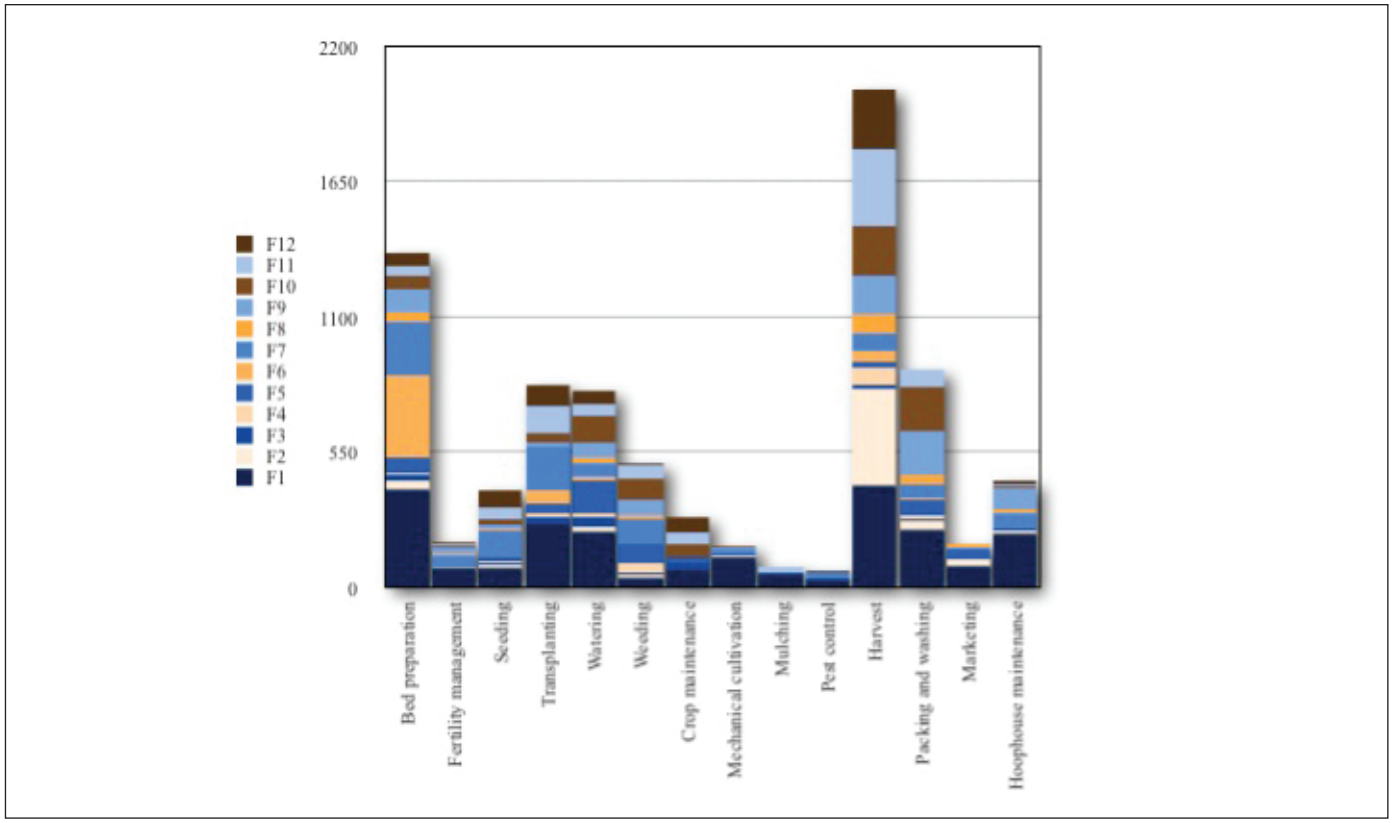


Figure 11. Labor use (in person hours) by category for all farmers.

Table 3 depicts the differences in labor use between the data from all farmers averaged with the data for farmer F12, the highest effective wage earner. If we look at broad planting categories, F12 spent more time on planting (although this was seeding and transplanting as opposed to bed preparation and fertility management) than on maintenance (although he spent a lot more time than average on crop maintenance, which includes miscellaneous activities such as trimming dead leaves and trellising tomatoes). F12 spent a similar amount of time as the average farmer on harvest-related activities, although F12 reported no time spent on packing and washing crops (which may just reflect neglect to report this category).

Table 3. Labor differences between all farmers and F12.

Category	Activity	All farmers	%	F12	%	% Difference
Planting	Bed prep	927.4	14.3%	57.0	9.4%	-34.58
	Fert mgmt	158.1	2.4%	8.2	1.4%	-44.71
	Seed	268.5	4.1%	69.9	11.5%	176.81
	Trnsplnt	568.8	8.8%	84.8	13.9%	58.70
	Mech cult	159.1	2.5%	0.0	0.0%	-100.00
	Subtotal		**32%**		**36%**	**12.40**
Maintenance	Water	665.7	10.3%	51.7	8.5%	-17.43
	Weed	436.9	6.7%	10.4	1.7%	-74.75
	Crop maint	174.3	2.7%	64.2	10.5%	291.68
	Pest	58.6	0.9%	8.1	1.3%	46.61
	Hoop maint	410.6	6.3%	14.3	2.3%	-62.95
	Subtotal		**27%**		**24%**	**-9.47**
Harvest	Pack/wash	865.0	13.4%	0.0	0.0%	-100.00
	Harvest	1781.0	27.5%	240.0	39.4%	43.36
	Subtotal		**40.9%**		**39.4%**	**-3.51**
Total		6474.1	100%	608.5	100%	

The relatively higher amount of time spent on both planting activities and harvesting activities with less on maintenance also suggests that farmer F12 may have been more successful simply because one has to plant to be able to make money, and this farmer put more in the ground, spent less time maintaining it and harvested more efficiently.

What types of costs were there?

This section describes the particular categories of costs associated with the hoophouses. Farmers were asked to submit these data only in the last two years of data collection. All the figures below are total figures for the two-year period (give or take a month).[8]

Figure 12 illustrates how much money each farmer spent over a two-year period as well as in which categories the money was spent. For example, 75 percent of farmer F11's costs (about $3,000) were spent on hired labor over this period. On the other hand, F12 spent more money on fertility inputs than other farmers (almost $1,000) and far more on transplants than other farmers (about $1,500).

[8] F6 was omitted because he did not submit these data.

Figure 12. Input costs by category for each farmer over a 24-month period.

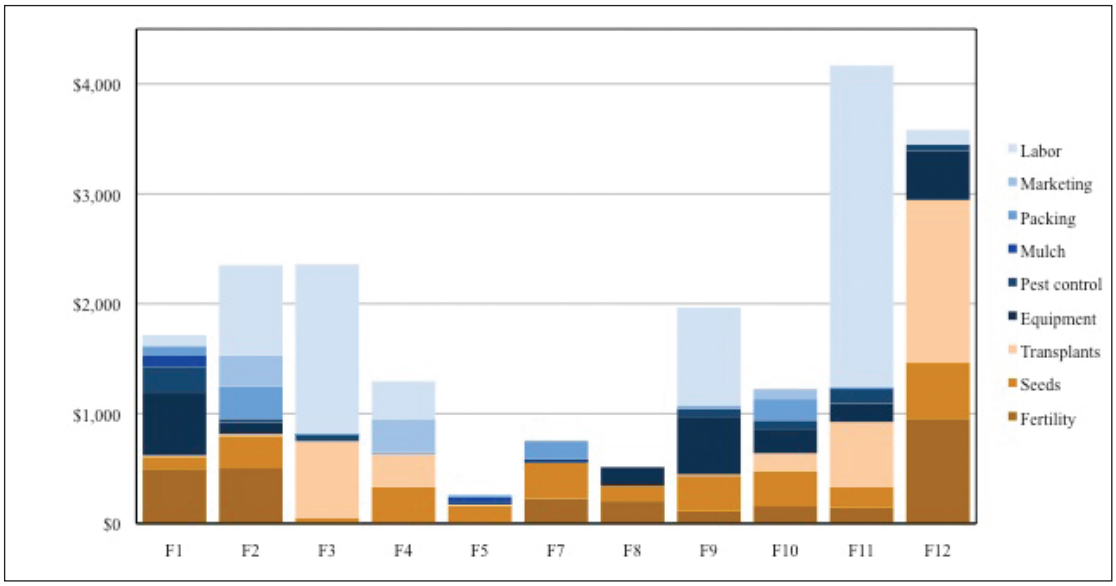
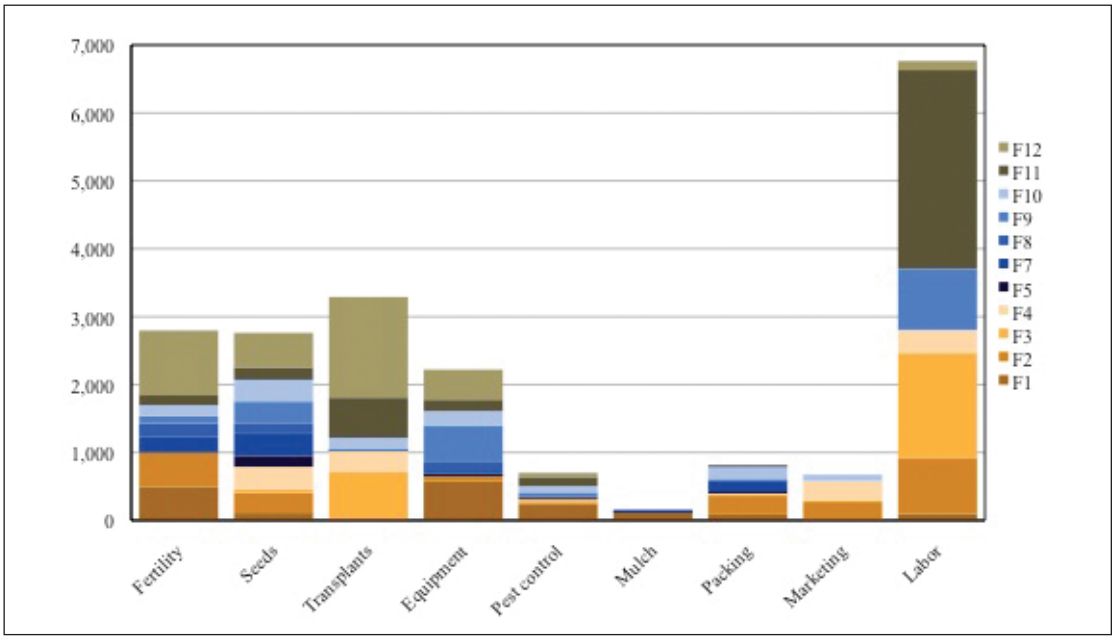


Figure 13 illustrates categories in which farmers as a whole invested money.



Clearly, the greatest expenses were for hired labor, although most of this cost can be attributed to about one third of the farmers. Overall, most farmers spent their money on four categories: fertility, seeds, transplants and equipment.

When we compare two farmers' costs over time in Figure 14, we see that F2 gradually increased spending in the hoophouse, and F12 had a high initial investment and continued to spend a considerable amount more during each shoulder of the season (March-May and August-September). These farmers had two very different approaches to spending in the hoophouse, but both were successful. As noted above, F12 made a consistently higher effective wage.

The pie chart below (Figure 15) illustrates the average input expenditures excluding costs of hired labor. The larger expenses are for seeds, fertility, transplants and equipment; marketing, packing, pest control and mulch are smaller. Hired labor, which is not included here, averaged about 30 percent of total expenditures across farms.

Figure 14. Comparing total input costs over time for farmers F2 and F12.

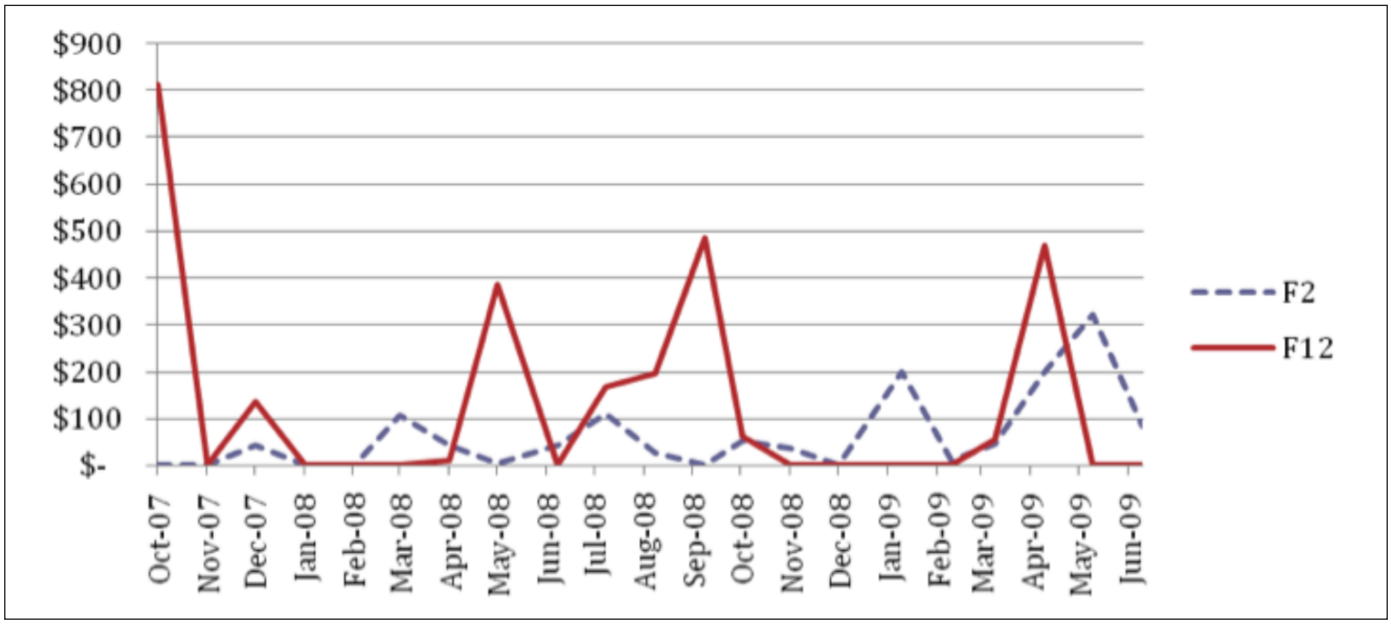
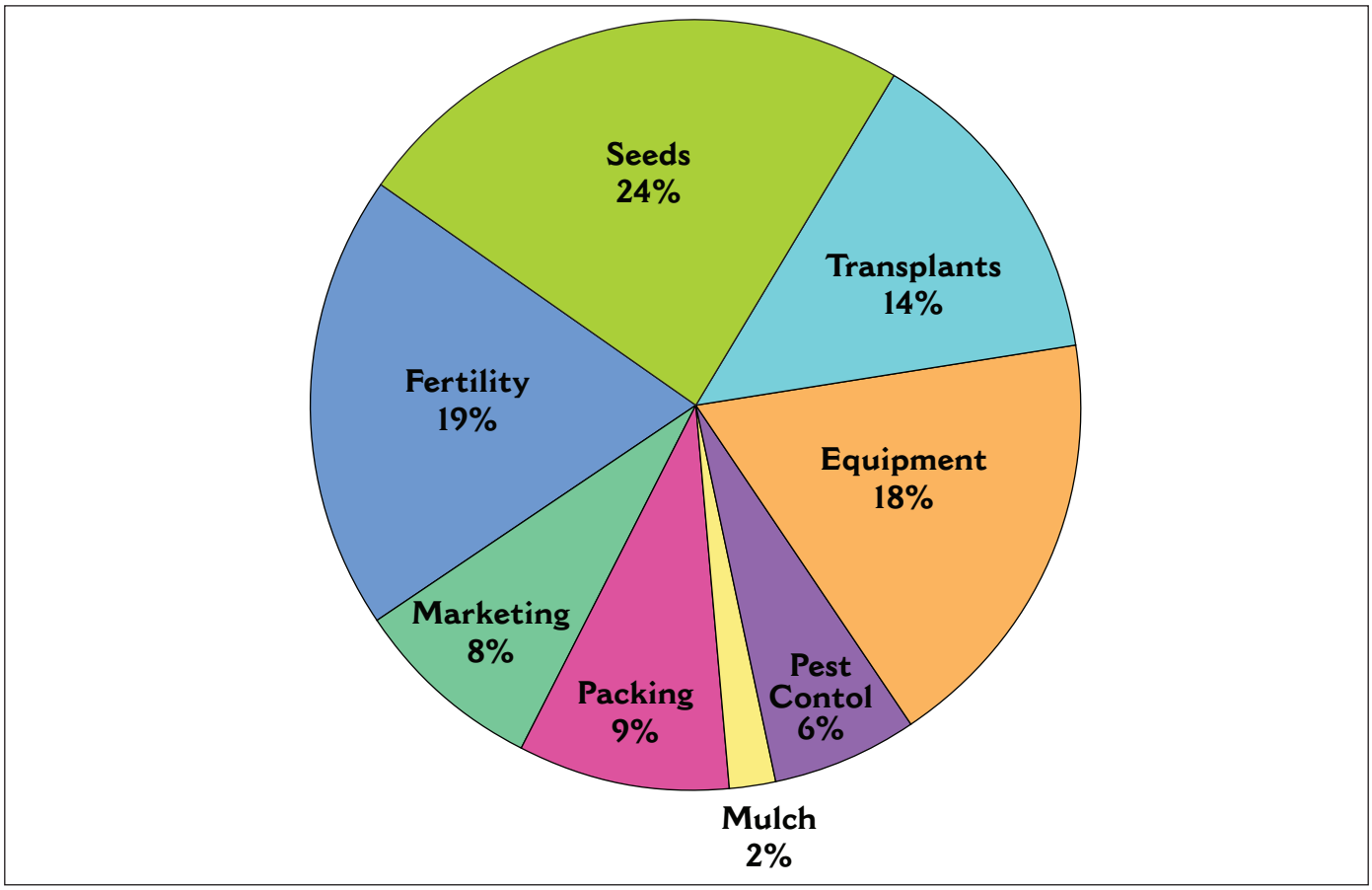


Figure 15. Average input expenditures (excluding hired labor).



Is a hoophouse right for me?

The data presented above from the 12 farmers participating in this study demonstrate that hoophouses can be an effective way to extend the growing season in Michigan. The wide range in expenses, income and profit is likely an indicator that there are factors influencing success that are not entirely clear in this small sample of novice growers. There appears to be a learning curve even for experienced outdoor growers. A part of the learning curve is considering the timing of work in the hoophouse relative to work in the field so that neither is neglected at the expense of the other. Though it was not well tested or demonstrated in this study, the authors believe an important opportunity exists for growers to make use of a hoophouse on the tail end of the season for a second and third planting to get a late fall/ winter harvest.

A hoophouse farmer is faced with numerous decisions about input costs, activities to focus one's time on and marketing his/her crops. In addition to scheduling, crop selection and space allocation to each crop are very important. The crops grown or the amounts of each crop grown were not reported in detail as part of this study. Data from the MSU SOF suggest that, though 20 to 25 crops are grown in the hoophouses, more than half of the harvest yield and income can be attributed to three or four crops that are grown in larger areas than the other crops. The high crop diversity is important for an effective crop rotation, to minimize risk due to possible crop loss or damage, and to satisfy the requirements for diverse product offering in most direct markets such CSA and farmers' markets, but the balance with high income crops is important for profitability.

Hoophouse farming is a specialized type of agriculture, and it takes skill and experience to earn a decent wage. The authors hope that this report has shed some light on how this group of farmers chose to make these decisions and inspires more farmers to experiment with hoophouses.

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