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Machinery management for small- and medium-sized horticultural farms

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Machinery management for small- and medium-sized horticultural farms

Abstract

Machinery and equipment needs are far different for vegetable farms than for commodity production units. This project explored the unique machinery access options for small and mid-sized horticulture operations.

Keywords

Economics, Center for Crops Utilization Research, Business management distribution and marketing

Disciplines

Agricultural Economics | Business Administration, Management, and Operations | Entrepreneurial and Small Business Operations | Horticulture | Marketing



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Abstract: Machinery and equipment needs are far different for vegetable farms than for commodity production units. This project explored the unique machinery access options for small and mid-sized horticulture operations.

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Budget:

\$30,292 for year one
\$16,019 for year two

QHow can small-scale fruit and vegetable producers evaluate machinery adoption and plan for mechanization? What are the alternatives for acquiring machinery services, and what are key factors to evaluate, including appropriate machinery size and the timing and sequencing of operations?

AGrowers use a variety of methods for acquiring access to machinery, including purchasing, renting, borrowing and sharing. While larger farms tend to be more mechanized, other factors were important in determining the amount and type of machinery employed in the operation, including diversity of crops, marketing outlets, and availability of labor.



MARKETING

Background

Greater consumer awareness and increased interest in local foods have encouraged many small-scale fruit and vegetable growers to scale up to meet the demand. Specialized equipment for fruit and vegetable production saves labor but the purchase prices may be prohibitive for small-scale producers. Growers lack information about how to evaluate machinery adoption and planning for mechanization in the context of a Midwestern small-scale fruit and vegetable operation.

The specific objectives of this project were to:

1. Survey small and medium-sized fruit and vegetable growers about their current machinery ownership and use, labor requirements, interest in sharing machinery and expected machinery needs related to expansion;
2. Select a set of producers for four case study analyses to provide more in-depth information about the machinery-related challenges faced by growers;
3. Synthesize the information gained to develop machinery management educational materials that will help small- and medium-sized Iowa growers plan for expansion; and
4. Develop, market and conduct three outreach programs with targeted partners for small- and medium-sized Iowa fruit and vegetable growers.

Approach and methods

A survey of Iowa fruit and vegetable growers was conducted regarding their current machinery ownership and use, labor requirements, interest in sharing machinery and expected machinery needs related to expansion. More in-depth understanding about the machinery-related challenges faced by growers was gained through a set of six case study interviews with growers who have expanded their operations. The interviews helped explain how size, diversification, marketing strategies and production methods impact machinery adoption, as well as provide insights into how growers



Sharing labor and equipment, such as a mulch layer, is an efficient way to save time and money on tasks that are done only once a season. (Photo: Linda Naeve)

view labor/capital tradeoffs and prioritize their purchases as they build their machinery sets. Based on findings from this primary data collection, the researchers developed a linear programming model that optimizes enterprise selection and scheduling under various types of machinery use. Six farms were selected to participate in the project.

Results and discussion

A number of key findings from the survey of growers provide insight into the labor and machinery decisions of producers. Slightly more than half of respondents have less than five acres in fruit and vegetable production; about 40 percent specialized in fruit and vegetable production, while the remaining 60 percent included activities such as livestock or other crop/forage production. More farmers produced warm-season crops than cool-season crops and, understandably, employed more workers over the summer months.

Over half of surveyed farmers plan to expand their operations within the next five years and would be willing to share equipment. If produce farmers who expand their operations follow the trends of the survey subjects, an increase in acres devoted to produce will likely add to summer employment of labor and this also may lead to increased machinery purchases. The most commonly owned pieces of equipment among the surveyed growers were tractors, tillage implements and a pickup/van. An increase in the estimated crop type density (more crops per acre of land) tends to decrease machinery usage and increase labor usage.

By and large, farmers using a particular marketing strategy did not use labor and machinery differently. The crop species diversity of a given farm seems to differentiate the labor and machinery usage among farms. Farms growing a diverse set of crops with multiple perennial types (annual, tree-based, etc.) or seasonal types (warm, cool) tended to use more machines in their enterprise. Crops that differ by perennial or seasonal characteristics may require different actions or considerations. If a typical farm was considering expansion, it would need to define what such an “expansion” would be. If it were simply adding acreage and not changing the crop species grown, its crop species density would go down, meaning that it might consider purchasing a machine to replace some of its labor. If a farm were simply adding a new crop to its existing acreage, it may hire more workers since it would be less able to exploit economies of scale through mechanization. If the crop is similar to crops currently being grown, the machines the farmer has on hand still may be appropriate for the new crop.

Each of the six case farms had unique characteristics, but there were common themes. These farmers have marketed their crops in various ways including roadside stands, Community Supported Agriculture, wholesale outlets and co-operatives. Farmers described two ways in which they learned to manage their labor and machinery.

- Three farmers said that they learned how to manage their inputs through previous employment on vegetable farms and more or less replicated the production models of their previous employers.
- The other three described a learning process that was more experimental in nature, through borrowing different machinery before making purchases or gradually expanding their farms and learning as they went.



Mechanical weeders can greatly reduce the time and increased labor required for weed management and facilitate expansion of vegetable production. (Photo: Northeast Iowa Food & Fitness Initiative.)

This learning process seems crucial since four of the interviewed farmers warned against large-scale expansion prior to becoming knowledgeable about the marketing or production side of the business. Several farmers addressed the challenges of growing crops with different characteristics. One said that cool-season crops face a wetter growing season in the early spring and late fall which makes timeliness a larger factor than for crops grown in the summer. Another stated that although his perennial asparagus crop did not need to be reseeded each year, harvesting pressure was more intensive throughout the growing season.

Conclusions

There is clearly no one-size fits all strategy for acquiring and incorporating equipment into fruit and vegetable operations. However, some common themes from the study are:

- Farms producing large quantities of similar crops tended to use more and larger pieces of equipment.
- Farms that grew a more diverse set of crops tended to use more labor.
- Mechanization can help to offset labor costs, but it does not entirely eliminate the need for labor. In general, harvesting remains a particularly labor-intensive task.
- How farmers choose to sell and market their crops has an impact on the purchase of machinery.
- Each farm in the case study is multifaceted, and typically a variety of considerations come into play when a purchase was made.

Additional insights from the case study interviews:

- As most farms expanded, they tended to consider adding more and larger equipment, either through purchase, rental, borrowing or sharing.
- Custom hiring occurred in instances where larger and more expensive pieces of equipment were required for a job, but were only needed in the short term, such as for large-scale tilling. Paying an individual to do a one-time task was a lot cheaper than purchasing an expensive piece of machinery.
- Farm size, number and type of crops grown, and variety of marketing outlets all impact the choices that farmers make in terms of machinery use.
- Larger farms tend to be more mechanized, yet farm labor is still very important.
- Growth of similar crops increased the number of tasks that could be completed by a specific piece of machinery, whereas a more diverse set of crops resulted in greater reliance on labor.
- Farmers often make machine purchasing choices based on observations of other farmers, use of machines from previous employment, and other personal experiences.

Impact of results

One of the findings that emerged in this project led to embarking on a related Leopold Center-funded project focused more directly on sharing equipment, “Innovative equipment solutions to reduce costs and improve productivity for small-scale fruit and vegetable growers,” M2013-07.

Education and outreach

Four *presentations* were given at field days and conferences:

Midwest Aronia Association, March 29-30, 2012, Des Moines, Iowa, 200 attendees.

National Women in Sustainable Agriculture conference, November 7, 2013, Des Moines, Iowa, 24 participants

Iowa Fruit and Vegetable Growers conference, January 23, 2014 Ankeny, Iowa, 26 participants

ISU Department of Horticulture seminar series, February 24, 2014, 18 attendees

Publications

Potential for Machinery: A Case Study of Fruit and Vegetable Growers in Iowa, available on the Leopold Center website:

www.leopold.iastate.edu/case-study-machinery-sharing

Pates, Nicholas. Mechanization potential for expanding Midwestern fruit and vegetable enterprises, M.S. Thesis, Department of Economics, Iowa State University, August 2013.

Leveraged funds

An additional \$57,342 was leveraged for salaries and travel expenses from two USDA Rural Cooperative Development Grants.

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