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SCALING UP FRUIT AND VEGETABLE PRODUCTION: IS MACHINERY SHARING A POSSIBILITY?

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Abstract

Interest in local food is growing among consumers and small-scale farmers, as evidenced by the significant increase in the number of farmers' markets, community-supported agriculture arrangements, and food hubs, in the last ten years. To meet the demand for locally grown fruits and vegetables, many small-scale farmers are considering scaling up their production. However, to remain profitable they need to balance production with increased labor costs and the need for specialized machinery. A study conducted in Iowa worked with five groups of farmers who shared different pieces of machinery. With help from the researchers, they developed sharing agreements and continue to share equipment and other inputs. This article provides an overview of the benefits and challenges of machinery sharing as well as provides practical considerations for growers who may want to form a machinery-sharing arrangement.

Keywords: Local Foods, Machinery Sharing, Small-Scale, Producers

Introduction

Throughout the U.S., interest in local foods is growing, among both consumers and producers. As the household consumer demand for locally produced food grows, so does the demand from businesses, such as restaurants, schools, supermarkets, and other institutions. According to a January 2015 report to Congress titled *Trends in U.S. Local and Regional Food Systems*, nearly 8% of all U.S. farms market foods locally, either through farmers' markets, community-supported agriculture arrangements (CSAs), with one in three selling via intermediate markets, such as restaurants, grocery stores, food hubs or institutions (Low et al, 2015). Although the number of farmers markets in the U.S. increased significantly between 1994 and 2012, averaging a 17% increase every two years, the growth has plateaued with only a 5% increase between 2012 and 2014 (USDA Agricultural Marketing Service, 2014). Low et al. (2015) found that while the growth of direct-to-consumer sales such as farmers markets and CSAs is peaking, sales to intermediate markets are skyrocketing. Their report summarized that the economic opportunities in local food extend beyond small markets, and an increasing number of local growers are entering the marketing mainstream through wholesale markets. The study also found that the vast majority of farms (85%) selling local foods have a gross cash farm income below \$75,000 and account for only 13% of local food sales. In comparison, 67% of local food sales were made by the 5% of local food producers with gross cash farm income above \$350,000. To scale up their production level, meet the growing demand and increase profitability, local fruit and vegetable growers need to find ways to increase labor or improve labor efficiency through mechanization and other labor-saving innovations.

Given the financial constraints faced by small-scale growers, particularly those who are new to agriculture, there is a strong interest in sharing machinery in order to reduce costs. Evidence from a survey of fruit and vegetable growers undertaken in January 2012 supports this notion

(Artz et al., 2014). Seventy percent of the respondents answered they would consider sharing equipment with other growers. Small-scale growers face some unique challenges for sharing machinery. Relative to row crop operations, there is greater diversity of specialized equipment used by fruit and vegetable growers, such as small tractors, transplanters, bed shapers, planters for multiple-sized seed, mulch layers, mulch removers, rotavators, potato, and root crop diggers. Leasing, renting or custom hiring machinery can be a lower cost option, but in many regions these options simply do not exist for the range of specialized equipment used in small-scale fruit and vegetable production.

Sharing among these growers typically involves a greater number of producers who are geographically dispersed, making transportation and logistics of scheduling use more complex. Finally, many specialty crop growers are new to agriculture and are not experienced equipment operators. This raises an additional question of the necessary skills required to safely and properly operate machinery which may be shared.

These issues were addressed through a case study conducted in 2013 with small-scale fruit and vegetable producers in Iowa by faculty and staff at Iowa State University. The study, funded by the Leopold Center for Sustainable Agriculture, worked with five groups of producers on different types of equipment sharing strategies to develop cases and best practices associated with machinery sharing. The objective of the equipment sharing project was to create awareness of alternative strategies for equipment ownership that growers can implement in their operations to enhance profitability and reduce risk when scaling up production.

Methods

In February 2013, emails were sent to several key groups, organizations, and individuals asking them to promote the opportunity for commercial fruit and vegetable growers in Iowa and to solicit applications from growers. Applicants were required to identify a specific piece of machinery to be shared and to name a group of two or more farmers interested in participating in the sharing agreement. The study worked with five groups which were required to develop a machinery-sharing agreement and followed it as they shared their specific piece of machinery throughout the 2013 growing season. The groups also completed and provided time-use logs and financial records for their shared equipment and provided input and suggestions regarding the operation of their specific equipment-sharing model.

Participating farmers received compensation for their participation. Many of the growers applied these funds toward the purchase price and/or maintenance of the shared equipment (Table 1). The researchers assisted the groups in developing their sharing agreements. Templates were provided for their equipment-use time logs and financial records. An orientation teleconference was held to discuss procedures, timelines, and project requirements. Follow-up meetings were held with three groups to observe the equipment in operation and discuss their equipment-sharing model. An electronic survey of the 21 participating farmers was conducted after the first growing season to gather information on the effectiveness, growth, and sustainability of their machinery-sharing group and agreement.

Table 1. Characteristics of Equipment Sharing Groups

Case: Equipment Shared	Number of members	Total number of Acres	Approximate Distance Between Farms	Age Range of Growers
Holland Transplanter Mulch Layer	2	2.25	30 miles	27-51
Multi-use tool bar and attachments	3	4.5	18-20 miles	30-56
Joanna 3 Aronia Harvester	8	40	50-mile radius from a centrally located farm	40-65
ECO 1 Weeder	3	10	20-25 miles	59-70
Garlic separator	3	5	10-30 miles	26-38

Case: Equipment Shared	Type of ownership	Members with Off- farm Employment	Labor
Holland Transplanter Mulch Layer	Equal co-ownership	2 work full-time off- farm	One grower relies on family and some seasonal help
Multi-use toolbar and attachments	Equal co-owned by two members	2 work part-time off- farm	One grower hires 1 part-time employee
Joanna 3 Aronia Harvester	Equal Co-ownership	3 have full-time off-farm employment	Each grower provides two laborers at their own expense and the LLC hires one laborer
ECO 1 Weeder	Equal co-ownership	1 grower works part- time in winter & 1 works full-time year round	One grower hires one part- time employee, two growers rely on family
Garlic separator	Co-ownership: 70:15:15	1 works part-time off- farm	No outside labor hired

Discussion

Why Share?

The first thing to understand is why growers would incorporate machinery sharing in their production system. The primary reason many producers consider sharing machinery is the potential for reduced costs. In many cases, owning a share of a high-priced machine reduces individual investment and invested capital. However, the possible benefits of shared use extend beyond the cost savings. Sharing may frequently be one of very few, or the only means by which a small-scale grower can feasibly acquire use of equipment used infrequently that is relatively expensive, since owning this type of equipment individually is cost prohibitive. The access to farming equipment can improve productivity and quality, and replace expensive or hard to find labor. Higher capacity equipment can reduce the time spent to complete critical operations (e.g., planting or harvesting before rain), thus significantly reducing production risk and even facilitating expansion.

After sharing equipment for a season, 43% (9 of 21) of participating farmers completed an electronic survey which found that 56% did not recoup all of their investment after one season but felt machinery-sharing improved efficiency on their farm. One farmer said machinery-sharing saved him more than 150 hours per season, 1 estimated it saved between 51 and 100 hours, and 5 farmers felt it saved them some time, but less than 50 hours per season. However, 11% said the practice of sharing machinery within a group improved considerably in efficiency and effectiveness, and 89% said it improved somewhat.

Beyond the potential for cost savings, sharing can lead to a number of other potential benefits. Working in a group can allow members to specialize in the tasks they are best at, or most enjoy, which can improve labor productivity. Group members share ideas and expertise that improve production practices on all members' farms. Co-ownership or shared leasing of a machine can create opportunities for custom work, adding an additional income source for small farmers. Collaborating can help smaller farmers attain some advantages of larger farms, such as access to volume discounts on inputs, and better terms for obtaining credit, storage, services and marketing and distribution opportunities. Equipment sharing can lead to collaboration in marketing or selling farm products; for example, the group may be able to attract specialty contracts that pay premiums for delivery of a larger amount of product. Like marketing cooperatives which obtain higher retail prices through quality assurance, smaller farmer groups may be able to successfully coordinate production practices such as planting and harvest times, in order to maximize quality specifications (Sexton and Iskow, 1988). The survey of farmers participating in the machinery sharing project showed that one group marketed farm outputs together, and one group shared labor. Except for one group in which 2 of the 3 members discontinued commercial vegetable production after the first year of sharing, the other 4 groups continue to share the equipment purchased for the project. Two groups have purchased additional machinery to share.

What to Share?

Not all equipment lends itself easily to a sharing arrangement. In general, equipment for which the timing of use is critical or which is needed very frequently for relatively long periods of time would be challenging to share with other growers. In contrast, the types of equipment needed only once or a few times per year and for which the timing of use is more flexible are good candidates for a sharing agreement. For example, the window of opportunity for using a plastic

mulch layer could be a few weeks, giving partners the flexibility needed to move the equipment between farms. There are exceptions to this rule, however. One of the cases in our study jointly purchased and shared a mechanical weeder. Weed control is an ongoing task throughout the growing season and a fairly time sensitive task. The three growers involved in sharing the mechanical weeder were able to structure an agreement that overcame the challenges involved since their operations were small, and they were located in close proximity. The members of this group agreed that a small group size is important when sharing the mechanical weeder; they felt due to the frequency and timing of its use, they could not accommodate additional members.

Another important consideration in choosing equipment to share is compatibility with other equipment owned by members such as tractors. Compatibility of the equipment between the member farms is also a concern. Will the equipment work with all partners' plant and row spacing, for example? In addition to operating expenses such as fuel, other shared expenses may include labor needed to operate the equipment, other materials such as plastic for the mulch layer or totes for a berry harvester, and the costs of transporting the equipment to members' farms.

How to Share?

Alternative Models

There is no "right" way to organize a machinery sharing arrangement. They range from very informal, "handshake" agreements, to highly structured business entities. The appropriate organizational structure for any given group will depend on group goals, the extent of shared resources involved, and the nature of the relationship between partners.

Sharing does not necessarily need to involve joint ownership of machinery. Group members may individually own pieces of equipment and agree to share their use. For example, one grower might own a mulch layer while another owns a transplanter. They could agree to contribute the equipment for use by the group. This type of arrangement is simple in that while the equipment is shared, the costs of owning, maintaining, insuring and housing the machinery are borne by the individual owners. As long as group members feel as though the contributions of each member are roughly equal, or there is a mechanism to provide fair compensation to the individual owners this model works well. In addition, some lenders and leasing companies may prefer individual ownership of pieces of equipment because the loan (or lease) is held by one individual rather than several individuals.

In other cases, group members jointly acquire the equipment to be shared, either by leasing or purchasing the machinery together. Typically, group members each contributes a portion of the cost of the machinery if purchasing outright, or the necessary down-payment, if financing the machine. These upfront costs may be shared equally among group members, for example in a three-member group each provide one-third of the cost, or they may be shared in some other appropriate fraction, perhaps in proportion to acreage or anticipated use of the machine. Members also share the costs of operating and maintaining the machine. These variable costs are most often shared in proportion to use, either by contributing an agreed rate per acre or per hour to a common account used to make loan or lease payments and cover other expenses. Another method used to calculate the amount paid by each farmer is tracking their use of the machinery and individually paid expenses and 'settling up' at the end of the season.

Some growers prefer to have a more formal ownership arrangement, such as a limited liability company, partnership, or cooperative. Forming a legal business entity to facilitate equipment sharing may be especially important when several pieces of machinery are shared, or when group members do not know each other well prior to forming the equipment sharing group. Such arrangements increase the need for good record keeping and cooperation, but can reduce overall costs significantly, as well as increase labor flexibility.

Operating Agreement Considerations

While many successful sharing arrangements have operated for years with no formal legal structure or written contract, taking time to discuss details in advance, including potential conflicts and how they will be resolved, is worth the additional effort. An operating agreement is a written document that outlines the specifics of how an equipment sharing arrangement will work and outlines the key rights and responsibilities of each member in the arrangement. A basic operating agreement for any business type includes language about the parties involved, management of the business, member voting procedures and rights, and dissolution. There are four very general categories of issues that should be addressed within an operating agreement: 1) operational issues, 2) division of benefits and costs, 3) financing issues, and 4) strategic issues.

Operational issues outline how the group will use, transport and maintain the equipment on a day to day basis. It should include what equipment will be shared, how use will be scheduled, what is the timeline for service and maintenance, how the equipment will be stored, insured and transported between members' farms, who is qualified to operate the equipment and whether it be used outside of the group for custom or contract work. The division of benefit and costs category outlines details such as what records will be kept, how expenses will be allocated among members as well as when members are expected to contribute funds, and who is responsible for paying expenses. Financing issues addressed in an operating agreement might include details about which lenders can be used, how much capital is required from each member to form the sharing arrangement, and how and when are new capital contributions made. Finally, strategic issues focus on changes to the sharing arrangement which may have longer term impacts on its benefits and costs. These can include the process used to add or remove partners, how to transfer ownership between partners, how increases or decreases in land base will be handled, how the arrangement will be dissolved, and how to address the death or retirement of a partner.

The groups in the study were required to develop an operating agreement. Some were very simple, one-page documents outlining the terms of use and procedures to be followed in case a partner should wish to withdraw from the agreement. Others were more detailed due to the size of the group and the higher value of equipment being shared. Although the question was only completed by 4 participants, 1 said the machinery-sharing agreement was very important to his group, and he referred to it often. Another said it was somewhat important to his group, and they referred to it occasionally when something needed clarifying. Two farmers said their group never referred back to their sharing agreement during the first season. The group that dissolved said that the agreement was very valuable to them when 2 discontinued farming and only one remained.

With Whom to Share?

One of the most important, and often most challenging, aspects of forming an equipment sharing arrangement is finding partners you can trust and with whom you can communicate and work with effectively. One way to think about the types of characteristics you might seek in potential partners is to consider both similarities and complementarities. For some aspects of the farming operation, you will want to find like-minded partners. For example, most people have a natural tendency to associate with people who are “like” them. This can make communication among group members and group decision making easier, but assembling a group of “like” members may also result in overlapping skills and knowledge. It may be advantageous to have partners who complement each other and their operations. If members bring different skills, strengths, and interests to the group, the total may be greater than the sum of the parts. For example, if some members do not like bookwork and numbers, including a partner who enjoys these tasks could provide a real benefit.

Some of the key areas to consider are farm characteristics, work habits, personal traits and unique skills. Farm characteristics include the type and diversity of production on partners’ farms, cropping systems, and farming practices, and compatibility of machinery. Whether potential partners have off-farm jobs or need time to care for livestock may also be an important consideration. Work habits encompass personal preferences such as keeping regular hours versus working until the job is done and preferring to fix machinery “right” versus fixing it quickly to keep the work moving. While some differences in work habits can cause conflict, other differences can lend an advantage. For example, if one partner tends to work early while another tends to work late, it might be relatively easy to schedule use of a shared machine.

Finally, while many people often do not think about personality traits as a factor in farm management, they can play a big role in the success of group activities like equipment sharing. Flexibility around issues such as when crops are planted and harvested is certainly critical. Other personality traits, like openness to new ideas and a willingness to take risks, can be important as well. Partners who complement each other’s strengths may be advantageous. If a farmer prefers to work alone, a sharing arrangement may not be for him or her. But if cooperating farmers prefer to work with others, a joint operation may make farming more rewarding and enjoyable.

Conclusion

The study revealed six common themes, or lessons learned when it comes to forming and sustaining a successful equipment sharing group. These are shared subsequently in turn. The first lesson is that trust and communication are important. Trust and good communication are important factors for making shared equipment use successful. This is extremely important when the partnerships are forming. Transparency about what type of equipment is being purchased to share, who will store it and what are the costs to operate and maintain the equipment is critical to build trust and a good business relationship. Also, plant and row spacing needs of the equipment may need to be communicated early in the planning, so the machine and crop spacing are compatible. In one group, two potential partners pulled out of the sharing project because they felt there was not enough communication about the machinery, its purchase price, and how it would save them time and money. They also felt excluded from the group decision-making process.

The second lesson is that compatibility matters. When choosing partners for a sharing arrangement, growers should consider both similarities and complementarities of the farms and people involved. One group interviewed works because they are all beginning farmers who have skills, strengths, and interests that complement each other. This good embodied the idea that “the sum may be greater than the parts.” Another group of three fruit and vegetable growers intended to participate in the project and share a plastic mulch remover. However, the partnership never materialized because their farm and off-farm job schedules prevented them from adequately communicating with each other. In addition, these growers were at different stages in their lives and farming experience, which complicated the equipment purchase and transportation logistics. The partnership for the mulch remover did not materialize because the three farmers were not compatible in distance, experience, and their length of commitment to the partnership. Having farms with similar production methods, such as certified organic, makes the use and maintenance of the machinery less complicated, but differences are not insurmountable. A group of aronia berry growers in the study is made up of compatible producers of diverse backgrounds and skills; however, not all are certified organic. The certified organic producers require a strict policy for cleaning and washing the machine at the place of harvest after it is used and before it is moved to the next location. Each cleaning is documented in an equipment clean-out log. A portable pressure washer purchased by the group and a cleaning solution supported by Organic Materials Review Institute (OMRI) traveled with the harvester.

The third lesson is considering the complexity of the equipment and the learning Curve. Unlike a lawn mower that works the same in most backyard situations, farm equipment does not perform the same from field to field, under a variety of soil types and terrain and when pulled by different sizes and types of tractors. Even equipment that appears relatively easy to operate, such as a plastic mulch layer or an Eco-weeder, requires some initial time to learn how to adjust and run the machine in different fields. For example, if the plastic mulch layer is used incorrectly, the plastic will not lay properly and can blow away. Also, various tractor tire spacings and hitches can require time-consuming adjustments for some equipment. The rotary tines on the Eco-weeder need to be adjusted to fit the slope of the land. A lead partner or equipment coordinator may be needed when a shared machine is complicated to operate or requires specific routine maintenance.

The fourth lesson is distance matters. It is typically assumed that close proximity will make sharing equipment easier by reducing transportation costs and allowing the equipment to be used more frequently. However, in certain situations, long-distance sharing can make sense. One advantage of long-distance sharing is conflicts over scheduling can be avoided if there is enough variation in the growing seasons of participating farms, and the equipment is used only once per season. For these reasons, a plastic mulch layer, plastic remover or potato/root crop digger could be a good candidate for long-distance sharing.

The fifth lesson is not everything is worth sharing. In addition to considering the cost of mileage and time spent in transport, it is important to think about the labor required, the need for timeliness, and the difficulty of the task the machine would perform. For example, two early partners of the garlic separator team determined that there was not enough value to them to justify their participation. They concluded that it would take as much time to haul their garlic to another farm to use the separator, as it would to separate the garlic cloves by hand. Since

separating the cloves was not weather, soil, or daylight dependent and did not need to be completed in a short window of time, they couldn't justify the expense.

The sixth and final lesson is equipment sharing can evolve into greater partnerships. There is a lot of potential for small-scale fruit and vegetable producers to expand their partnerships beyond machinery sharing. A natural extension would be to cooperatively purchase transplants and supplies, such as crates, boxes, and bags, to reduce the unit costs. These partnerships can also evolve into shared marketing of the product. One group of three women in the study initially teamed up as beginning farmers to help each other with their marketing which lead to the development of a 3-farm CSA. Aggregation and the development of local food hubs for wholesale distribution could also be an outcome of machinery-sharing partnerships.

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