Agricultural Marketing Resource Center
Value-added Agriculture Profile
Iowa State University

November 2008

Lesson #1: Growing a Career on a Small Family Farm: Supplying biodiesel producers in Montana's Flathead Valley case study

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Funding was provided, in part, by the Agricultural Marketing Resource Center.

[1]The authors prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. The cooperation and contributions made by Chris Fritz are greatly appreciated.

Introduction

Chris Fritz graduated with an Agricultural Business degree from Montana State University (MSU) in Bozeman in 2006. Chris was raised on his parents' farm near Kalispell, MT, and like many students from Montana farms and ranches, wanted to return home and work in production agriculture. As is often the case, however, small family farms cannot always provide full-time income for even a single family – let alone two or more. Chris needed to find employment opportunities related to production agriculture to realize his dream of continuing his family's farming tradition in Montana's beautiful Flathead Valley.

Options and Opportunities

A potential opportunity grabbed Chris's attention well before graduation. Chris and his father had been following the development of a new crop, camelina, since 2004. Researchers at the nearby Northwest Montana Agricultural Research Center (NMARC) had been studying the agronomics of camelina as an oilseed crop. Oilseeds are not commonly grown in Montana because of short, dry growing seasons. Camelina is a short-season crop that requires few inputs. Because it is not a cereal grain, camelina offers crop rotation advantages for usual wheat/barley/fallow rotations.

Chris and his father planted 10 acres of camelina in 2005 with seed obtained from NMARC. Their first-year camelina yields ranged from 1,500 to 1,800 pounds per acre. At the time, a formal market for camelina did not exist. Hence, Chris's father set a market price for his crop of $0.35 per pound. He sold about one-half of the crop at this price. He then recognized that camelina was in limited supply and he raised the price for the remainder of his seed to $3.00 per pound. Shortly thereafter, a buyer purchased all of his remaining camelina.

Chris and his father recognized that the $3.00 per pound was not likely to be representative of future prices. Given that Flathead County winter and spring wheat yields average 61 and 57 bushels per acre, respectively, and prices average $3.51 for winter wheat and $3.80 per bushel for spring wheat, camelina appeared to be a reasonable substitute in terms of gross revenue per acre even at a price of $0.35 per pound. As importantly, however, was that much less fertilizer and herbicides were needed to produce camelina relative to traditional cereal grains. Nonetheless, Chris knew that risks are associated with any new crop, and he wanted to investigate these further. He had a chance to learn more about camelina during undergraduate courses at MSU.

Paul Miller and Sustainable Systems, LLC

Collegiate learning often centers on textbooks and professorial lectures. However, experiential learning (especially in the field of agribusiness management) has opened doors to new pedagogies. For example, Chris' senior-level Agricultural Business Management class incorporated case studies into its capstone-style approach. During Chris' senior year, the class experienced the development of biodiesel as part of their final class project. The class had the opportunity of listening to and questioning several managers of biodiesel related businesses--one of these managers was Paul Miller, CEO of Sustainable Systems LLC. Missoula, MT-based Sustainable Systems had been marketing biodiesel in Montana and was developing technologies to encourage small-scale biodiesel production.

Sustainable Systems had purchased an oilseed processing plant in Culbertson, MT. Vegetable oil produced from oilseeds is the main input for producing biodiesel, and the Culbertson plant was producing oil from flaxseed and other minor oilseed crops. In his interview with students, Paul explained the opportunities and challenges facing his company. He also shared issues related to small-scale production and marketing of biodiesel. Camelina was one of the potential oilseed crops that Sustainable Systems evaluated in their business plan. Camelina was produced on less than 20,000 acres in Montana at that time. The acreage was insufficient for Sustainable Systems' purposes, but Chris took careful notes and added this information to his growing knowledge of camelina.

Oilseed Processing Technology

Mechanical oilseed extraction involves two main elements. The first is seed preparation. Seed preparation methods vary depending upon seed characteristics. For oilseeds like canola and camelina, seed cleaning is the only preparation usually required. Other oilseeds, such as soybeans and sunflowers, may need to be cleaned, de-hulled, cracked, rolled and/or flaked before processing.

The second element is the removal of oil from oilseeds using mechanical pressure. Mechanical pressure is often applied with simple screw presses. Seed is placed into the press and a screw is used to apply pressure. The pressure forces oil out of the seed and through small openings in the sides of the chamber. The non-oil meal portion of the seed is too large to exit through the small openings and is extruded through a larger opening at the end of the press. Camelina meal is roughly the consistency of coarse potato chips and often extruded in small clumps that are easily broken apart. Screw presses are capable of removing approximately 65-75% of the oil contained in oilseeds under optimal conditions. For example, 100 pounds of an oilseed with a 40% oil content will generate 30 pounds of oil if the press is operating at a 75% recovery rate. Approximately 5% of the total weight of raw seed is lost as moisture during processing. The remaining 65 pounds of material is protein meal which contains about 10 pounds of unrecovered oil. To increase oil recovery rates, some mechanical presses preheat seed as it enters the press. This process can improve recovery rates by 5-10 percentage points. Alternatively, if seed is processed at low temperatures (for example, below freezing), oil recovery rates may decline to less than 60%. Actual recovery rates depend upon press quality, press operations, seed quality, seed type and seed temperatures.

Starting a Business Plan

Armed with a growing knowledge of oilseeds and oilseed processing, Chris began developing a plan for post-graduation employment. He knew that commercial oilseed production did not exist in the Flathead Valley. So, employment in this area would require that he start a new business. Limited oilseed production in the area needs to be addressed by his business plan. One unique aspect of oilseed processing is that equipment is available for a variety of operational scales.

The foundations of a business plan were beginning to emerge. Chris understood the technical process, and realized that limited quantities of oilseeds were available. He knew that small-scale processing equipment was available. The missing component for a business plan was information about markets for vegetable oil, biodiesel and oilseed meal.

Product Marketing Issues
Oil produced by oilseed processing can be used for cooking, salad dressings, lotions, lubricants and biofuels. Meal is generally used as feed for cattle, poultry, and other livestock. Different regulations apply to oilseed processing depending upon end-uses of oil and meal. These regulations include human food safety regulations, animal feed standards and standards for other products.

Oil Markets
Vegetable oil destined for human consumption must be processed with equipment that meets certain health and safety standards. Chris decided not to target human food markets. Although vegetable oil prices for non-human use are lower than those for human use, equipment and regulatory costs are also much lower for non-human oil production. In addition, human use vegetable oil markets require the production of large, consistent volumes. Furthermore, this market is relatively mature and dominated by major agribusinesses. An oilseed processing operation in the Flathead Valley would have to be small because of the limited amount of oilseed production in the area.

Chris believed that a few local residents might be interested in buying limited quantities of vegetable oil for the production of biodiesel. This local market would allow him to establish a business and generate a revenue stream while he continued to learn about oilseed processing and other potential oil markets.

Oilseed Meal Markets
Over 60% of oilseed processing results in the production of oilseed meal. Therefore, an oilseed processor must be able to market meal in addition to oil. Oilseed meal has been used for decades as a livestock feed in the United States. Consequently, finding a livestock producer interested in buying oilseed meal did not seem like a huge challenge. However, Chris discovered that several important issues regarding meal markets needed to be considered. For example, meal produced from camelina is not certified for use as a commercial animal feed in Montana. This was a major obstacle. Camelina meal can only be used as a livestock feed in Montana for research purposes, and non-feed markets are virtually non-existent. Therefore, this issue needed to be addressed before producing significant amounts of camelina meal. Several groups were investigating the mechanism for obtaining feed use approvals for camelina meal, but it was unclear when such approval would be obtained. Other oilseeds crops (canola, safflower, etc.) do not face this regulatory hurdle.

The Business Plan
After learning as much as he could about oilseeds and oilseed processing, Chris began developing a business plan. The plan was to purchase oilseed processing equipment with a capacity of 5 to 10 tons per day, and then sell non-human use vegetable oil and meal to interested buyers. Chris and his father would continue to allocate 20 to 50 acres of their 1,000 acres of cropland to camelina production. The oilseed processing operation would require more seed than they could produce. Therefore, they would need to buy oilseeds from other area farmers. The plan was going to require resources to purchase seed, equipment and for equipment installation. And, vegetable oil purchasers needed to be identified.

Equipment

Chris purchased 2 five-ton oilseed presses from Cropland Biodiesel in Lyndon, WA for a total of $12,000. The presses were installed in a vacant barn because it was a sound building with concrete floors and a water-tight roof. The barn also had on-site storage for oilseed feedstock and was large enough to store meal in piles on the concrete floor. The building was already wired with a 440-volt power supply required by the presses.

Installing the presses was not as simple as plugging them in and turning them on. First, Chris needed to install a seed cleaner which he obtained at a farm auction for $20. Then, a system had to be designed to auger cleaned seed into each press. Bins were required for collecting oil and meal. The old dairy barn already had some bins that would work for collecting meal, but oil bins had to be built. Once the basic installation was completed, the equipment had to be tested for functionality and efficiency. After some experimentation, Chris realized that by processing all of the material twice, he was able to recover about 18 pounds of oil per 100 pounds of seed. Given that his seed generally contained 29 pounds of oil, his system had a 62% recovery rate.

Oilseed presses tend to operate better at higher air, seed, and press temperatures. Chris could do little about air temperatures, except avoiding operating the presses on cold days, but he could influence press temperature. Even though the presses had small electric heaters built into them, they tended to warm even further after they had operated for an hour or two. By running each press for longer periods, the percentage of time when the press was warm could be increased. In addition to electrically heating each press, Chris also designed a system of hoses to carry hot water to the press and seed bin to further warm the material and equipment. The low-cost water heating system was built from a truck engine heater.

Feedstock Concerns

It was clear that his oilseed processing business would be able to process more feedstock that Chris and his father were going to produce on their own farm. They intended to plant around 30 acres of camelina in a typical year. Using an estimated yield of 1,000 pounds per acre (the 2007 average on the Fritz farm), their total annual production would be about 30,000 pounds. The oilseed processing equipment could process this quantity in two or three days.

Chris identified three options for obtaining additional oilseed for his operation. First, he could purchase seed in the spot market each fall. This would allow the most flexibility as Chris would have no obligation to purchase feedstock unless he needed it. However, the option provided him with no guarantee that he would be able to obtain necessary quantities. Second, he could contract for oilseed production with local farmers. Contracting would create a financial obligation to buy seed, but would also guarantee that, in the absence of a crop failure, he would have seed to process in the fall. Third, he could buy or rent additional land. However, oilseed production in the Flathead Valley usually occurs within a crop rotation once every three or four years. This option would only increase his oilseed acreage by one-third or one-fourth of the additional rental acres. Renting oilseed acreage on an annual basis would offer significant flexibility. However, such opportunities are not always available.

Each option had several benefits and risks. Chris decided that he would use a combination of these methods to acquire sufficient feedstock to supply his operation. For the 2008 growing

season, Chris intended to plant about 30 acres and contract 300 acres of camelina. He would purchase additional feedstock in the fall based on the needs of his business.

Finances

Financing a new business is a major obstacle for many entrepreneurs. Chris was able to overcome this obstacle by obtaining a $60,000 interest-only loan from a local bank and a $3,000 grant from the National Center for Appropriate Technology (NCAT). Approximately $12,000 was used to purchase equipment, while the remainder was used to purchase seed and pay other salary and non-salary expenses.

Marketing Oil

Obtaining seed and equipment was only part of the business plan. Another major component was a strategy to market oil and meal. Once oil is extracted, it must be filtered before being sold. The filters remove small particles of meal. Chris uses fivemicron filters so that local biodiesel producers can use his oil with minimal additional treatment. During his first year of operation, oil buyers were not difficult to find. Chris set his oil price at $0.40 per pound (about $3.00/gallon). Many buyers used his oil to produce biodiesel for personal use. With diesel prices projected to remain high for the near future, the market for oil to produce biodiesel appears strong in the short term. After his production increases, Chris may have to consider other oil markets. But for now, the local market appears to be sufficient.

Marketing Camelina Meal

Approximately 70% of oilseed processed by Chris becomes protein meal. Consequently, meal revenue is vital to business success. Unfortunately, camelina is a relatively new crop, and its meal does not have regulatory approval to be sold as animal feed in Montana. Several groups including Montana State University are researching the value of feeding camelina meal to cattle, goats, fish, and poultry. The brightest prospects appear to be its use as a source of omega-3 that may be transferred to livestock during the feeding process and, ultimately, to humans through meat consumption. Omega-3 research may be useful in obtaining regulatory approvals. However, this process takes time, and time is at premium for any business, but especially a new business. To speed the process, many companies involved with camelina agreed to join a consortium to develop and fund a single application. The consortium will share costs associated with the application. Even with this united effort, it seems unlikely that feed approvals will be obtained in 2008. With oilseed meal prices approaching $350 per ton, the wait seems agonizingly long for Chris.

Future Decisions

As Chris drives away from Helena, Montana on Highway 12 following a regulatory meeting over the future of camelina meal, he wonders if he has made the right decision regarding his business venture. Will his investment in oilseed processing pay dividends? Was there another option he should have pursued? Is he on the cusp of business success? Chris knows he took an investment risk, but he also knows that risky investments offer the highest potential returns.

Some days Chris thinks he and Montana have everything to gain from the development of camelina, but other days he wonders if he moved too quickly into an undeveloped industry. Chris finds it uncomfortable to be the first-mover in this market, yet strongly believes someone has to

push through the uncertainty so that small grain farmers can generate enough income to remain viable. Nonetheless, as he nears home and skirts picturesque Flathead Lake, he is at least comforted that his decision will give him a chance to continue to live in one of the most beautiful places in the United States.