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Lesson #1: Growing a Career on a Small Family Farm: Supplying Biodiesel Producers in Montana's Flathead Valley

By

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Objectives:

After completion of this lesson, the students will be able to:

1. Describe the biodiesel topics of this lesson by business structure, business origin and business profile: customers, competitors and the business's market share or niche.
2. Describe how biodiesel enterprises have overcome the challenges they faced when seeking to become a profitable enterprise.
3. Identify and describe opportunities which exist for biodiesel businesses in the future.

Materials/References Needed:

Growing a Career on a Small Family Farm: Supplying Biodiesel Producers in Montana's Flathead Valley**.** Joel Schumacher, Cole Arthun and Gary W. Brester, Dept of Economics and Agricultural Economics, Montana State University, Bozeman, MT.

What is Biodiesel? http://www.unh.edu/p2/biodiesel/

Visual Masters (VM):

VM-1 PPT Incorporating Lessons on Biodiesel into the Science Classroom, http://www.unh.edu/p2/biodiesel/media/NHSTA05.ppt.

VM-2 PPT Biodiesel, http://www.aspo-usa.com/proceedings/powerpoint/Biodiesel%20-%20Jeff%20Probst.ppt.

VM-3: PPT 3 Biodiesel production Economics. University of Idaho, http://www.uiweb.uidaho.edu/bioenergy/Feild2fuel_cda06/Haines_Montana_Economics_Summer%202006.pdf

VM-3: PPT 4 Economic Considerations of Biofuel Use in Georgia. John McKissick. Center for Agribusiness & Economic Development, University of Georgia, http://www.mga-cleancities.com/powerpoint/Biodiesel.ppt.

Interest Approach: http://www.pacfuel.com/historybd.htm

Rudolf Diesel patented his high-compression internal combustion engine in 1882, and in 1900 he demonstrated his compression ignition engine at the World's Exhibition in Paris. In that prototype engine he used peanut oil, the first biodiesel. Vegetable oils were used until the 1920s when an alteration was made to the engine, enabling it to use a residue of petroleum diesel. Although the diesel engine gained worldwide acceptance, biodiesel did not. With superior price, availability and government subsidies, petroleum diesel quickly became the fuel of choice for the diesel engine.

In the mid 1970s, fuel shortages revived interest in developing biodiesel as an alternative to petroleum diesel. However, as the petroleum market was increasingly subsidized, biodiesel was

again relegated to a minority “alternative” status. This political and economic struggle continues to limit the impact of the biodiesel industry today.

Now, increasing concerns about the potential of global climate change, declining air and water quality and serious human health concerns are inspiring the development of biodiesel, as a renewable, cleaner burning diesel alternative. Biodiesel is made from recycled vegetable oil and various feedstock (e.g., soy beans). As part of an active carbon cycle, biodiesel feedstock production reduces the buildup of greenhouse gases, and in turn, global warming.

Many fleet operators have made the switch to biodiesel, yet biodiesel consumption accounts for less than one percent of the total diesel fuel consumption in the United States. Additional industries seeking cleaner alternatives to sulfur-emitting diesel include transit bus fleets, heavy-duty truck fleets, airport shuttles, marine and national park boats and vehicles, mining, the military and many more. This case study chronicles the startup of a Montana oilseed (camelina) business whose customers are primarily individuals who use the oil to make biodiesel.

Student Activity:

When student numbers are sufficient, divide students into groups. Students should be instructed to:

- Read the biodiesel study assigned to their group.
- Where appropriate, divide the reading of the assigned biodiesel case study among their group.
- Each member is to provide an overview of his/her assigned reading to the group.
- Review and answer the questions related to their case study.
- Develop a clear, concise summary for the biodiesel topic assigned.
- Develop the profile on notebook paper. Use the backside of this paper to write the final version of the group’s answers and a profile of the wind generation topic assigned. Write the profile in bullet form.
- Use PPTs and WWW reference to instruct students on related aspects of biodiesel that apply chemistry, biology and economics.

Questions:

1. What motivated the Fritz's to initially grow camelina?

Answer: *Because it is not a cereal grain, it offered interesting crop rotation advantages for usual wheat/barley/fallow rotations. The per acre inputs required to produce camelina were advertised to be lower than traditional cereal grains.*

2. How did Chris learn about biodiesel opportunities?

Answer: *Chris' senior-level Agricultural Business Management class incorporates case studies of agribusinesses into its capstone-style approach. During Chris' senior year, the class considered the development of biodiesel as part of his final project. The class had the luxury of listening and questioning several managers in this fast developing industry. Paul Miller, CEO of Sustainable Systems, LLC, was one of these managers. Missoula, MT-based Sustainable Systems had been marketing biodiesel in Montana and developing technology to encourage small-scale biodiesel production. Sustainable Systems purchased an oilseed processing plant in Culbertson, MT.*

3. What are the two main components of mechanical oilseed extraction?

Answer: *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, the only preparation usually required is seed cleaning. 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. Most mechanical presses are simple screw presses. Screw presses feed seed from a hopper into a chamber and then mechanical pressure is applied by screwing a plate down onto the seed. 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.

4. What was missing from Chris Fritz's business plan regarding oilseed and biodiesel production?

Answer: *The missing component for a business plan was information regarding markets for vegetable oil, biodiesel and oilseed meal.*

5. What and who are the final consumers of oilseed products (oil and oilseed meal)? What are some of the categories of regulations and standards for these products?

Answer: *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 may include human food safety regulations, animal feed standards and standards for other products.*

6. Why did Chris Fritz decide not to target the human food market but focus his attention on producing oils for other markets?

Answer*: Chris decided not to target the human food market but focus his attention on producing oils for other markets. Markets for non-human use value vegetable oil at lower prices, but savings in equipment and regulatory costs make these markets the appropriate choice for Chris. In addition, vegetable markets require large, consistent volumes.*

However, Chris felt that a few local residents might be interested in buying limited quantities of vegetable oil to produce their own biodiesel. This local market would allow his business to get established and provide revenue while he continues to learn and understood oilseed processing and other potential oil markets.

7. What obstacle did Chris Fritz face when attempting to market the meal from camelina seed processing?

Answer: *Over 60 percent of oilseed processing results in the production of oilseed meal. 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 at first. 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 for livestock research purposes and for non-feed uses in Montana. Non-feed markets are virtually non-existent in Montana.*

8. What were the basic components of Chris's business plan?

Answer: *His plan was to purchase oilseed processing equipment with a capacity of 5 to 10 tons per day and then sell the oil (for non-human food uses) and meal to interested buyers. Chris and his father would continue to grow oilseeds on 20 to 50 acres (out of about 1,000 total acres) each year. The oilseed processing operation would require more seed than what they could produce. Therefore, they would need to buy oilseeds from other area farmers. This plan was going to require resources to purchase seed, equipment and equipment installation. Subsequently, vegetable oil purchasers needed to be identified.*

9. What equipment buildings were purchased or refitted for his oilseed processing operation?

Answer: *Two five-ton oilseed presses were purchased for a total of $12,000 from Cropland Biodiesel in Lyndon, Washington. The barn also has on-site storage for oilseed feedstock. The building was large enough to store meal in piles on the concrete floor. The building was already wired with a 220-volt power supply required by the presses.*

Installing the presses was not as simple as plugging them in and turning them on. First, a seed cleaner needed to be installed, which was purchased a farm auction for $20. Then, a system had to be designed to auger cleaned seed into each press. Bins needed to be built for collecting oil and meal.

10. How did Chris Fritz experiment with his "new" equipment to increase the efficiency of the oilseed crushing process?

Answer: *After some experimentation, Chris realized that by processing all the material twice he was able to recover about 18 pounds of oil per 100 pounds of seed processed. The seed started with 29 pounds of oil, therefore the system was able to recover 62 percent of the oil in the feedstock.*

By running each press for longer periods of time, the percentage of time when the press was cold can be reduced. In addition to heating press, Chris also designed a system of hoses that carry hot water to the press and seed bin to increase press and seed temperature prior to processing. The system was built from a truck engine heater at a low cost.

11. What concerns did Chris and his father have for feedstock (oilseed)?

Answer: *The limited acres of oilseed crops produced in the Flathead Valley are usually included as a crop rotation a maximum of one out of every three or four years. It was clear that the oilseed processing business would have the ability to process more feedstock that Chris and his father were going to produce on their own farm.*

12. What three options did Chris identify for obtaining additional oilseed for his operation?

Answer: *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 until he needed it. However, the option provided him with no guarantee that he would be able to obtain the needed seed quantity. Second, he could contract 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 and produce more oilseeds. However, given the rotational aspects of oilseeds, this option would only increase his oilseed production by one-third or one-fourth of the acreage acquired. Renting land, especially if it could be done on annual basis or for only the production of an oilseed, would offer significant flexibility. However, it is often not possible to develop such opportunities.*

13. Which option did Chris choose?

Answer: *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 intends to plant about 30 acres and contract 300 acres of camelina. He also may purchase additional feedstock in the fall based on the needs of his business.*

14. How would you assess the market for oil during the first year of Chris's business?

Answer: *During the first year of operation buyers for the oil were not difficult to find. Chris set the price at $0.40 per pound of oil (about $3.00/gallon). Many of the buyers used the oil to produce biodiesel for personal use. With diesel prices at high levels, the market for oil to produce biodiesel appears strong in the near future. Once his production increases, he may look to other markets for his oil but for now the local market looks to be sufficient.*

15. How would you assess the market for meal during the first year of Chris's business?

Answer: *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 meat obtained from such animals. Such research may be useful in obtaining regulatory approvals. However, this process takes time which is at premium for any business but especially a new business. To speed the process, many companies involved with camelina have agreed to join a consortium to develop a single application for approval.*

16. What questions does Chris ponder as he considers future decisions regarding his business?

Answer: *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 a risk making the investment, but he also knows that risky investments offer the highest potential returns.

Conclusion:

The main focus of this lesson is the successes, challenges and opportunities of the oilseed business, which produces oil for biodiesel. Through examining this case study of oilseed processing operations and business, students can learn, through real-life examples, about oilseed processing from an individual who took the initiative and monetary risk in an attempt to capture profits from a vegetable oil that is renewable and much more environmentally friendly when used as fuel in Rudolf Diesel's engine.