

On-Farm Biodiesel Production

Roger Rainville, Borderview Farm, Alburgh, Vermont

FARM OVERVIEW

200 acres

20% in oil seed crops

80% in alfalfa, corn, grass (60 head of young cattle), other forages

Rainville recommends growing sunflower or canola in a particular field for not more than 2 years in a row and preferably just 1 year. In a typical rotation, the oilseed crop would be followed by corn, soybeans then hay.

VIDEO SUMMARY

1. Crop Choice

- Canola gives the highest yield in terms of amount of oil per acre.
- Sunflower produces nearly as much as canola, and has the added advantages of being aesthetically more beautiful and easier to harvest.

2. Crop Harvest

- Timing is critical. Harvesting practices that are used in other parts of the country (mowing and swathing) may not work as well in the Northeast; any rain on the crop after mowing may cause problems.
- Let the canola ripen on the upright stalk. But don't let the crop dry too much on the stalk or you will lose seed at harvest due to seedpods shattering and dispersing the seed. Again, timing is critical.
- Equipment modifications may be necessary, especially with sunflower.

3. Drying Seed

- Drying bins with a perforated floor are the primary means for drying large quantities of seed.
- A mechanical aerator can be used for small quantities of seed.
- The drying process should be monitored closely so that the seed is not over-dried; if the seed is too dry it makes extraction difficult.

4. Moisture Level

- Optimum level for oil extraction in canola is 8-9% moisture.
- Optimum level for oil extraction in sunflower is 10-12% moisture.

5. Storage

- You must have facilities for storing seed (e.g. bins, silos, 1-ton tote bags.)

6. Production Equipment

- An on-farm biodiesel production system can be developed with an initial investment of under \$20,000 for all equipment: oil press extractor, biodiesel processor, containers for drying and storing)
- There are cheaper alternatives, but be aware of how equipment varies in quality, maintenance requirements, and durability.
- At Borderview Farm, Rainville has invested in higher-end equipment since there is a research component to his work with the University of Vermont. Equipment shown in the video:
 - German-made oil extractor is a KernKraft 40 (\$15,000). Presses 1000 pounds of seed in 24 hours to produce 20-30 gal. oil per day <<http://www.oelpresse.de/indexen.html>>
 - Chinese-made oil extractor (\$2,900). Presses 4 tons of seed in 24 hours = 160-240 gal oil per day

- Biodiesel processor is a BioPro 190 + Incosep accelerator + SpringPro T76 drywash system, using the latest conversion technology (approx. \$17,000)
<<http://www.springboardbiodiesel.com/commercial-biodiesel-processor>>
- With this setup, Rainville can produce 100 gallons of fuel a day given a ready supply of vegetable oil that has been extracted and clarified.

7. Pressing

- Once seed is dried to optimal moisture and stored properly, you can extract oil during the off-season whenever it's convenient.
- Note that oil presses differ in how closely they need to be monitored during pressing. The German-made extractor can run on its own, without someone being present. The Chinese-made extractor has a higher capacity, but is more prone to problems that require someone be present during the process.
- Once a day when oil is being extracted, oil is pumped into 250 gal. totes to settle out fine particles (1-2 months).

8. Processing Oil

- Finished oil is then pumped into biodiesel processor. A titration test is necessary to check for the fatty acid content of the oil. This test determines how much sodium hydroxide or methanol to add to complete the chemical reaction to remove glycerin. If you don't get the amounts correct, you could end up with soap!
- Processing 50 gal. vegetable oil will result in 10 gal. of glycerin.

9. Pump System

- Biodiesel must be stored in tanks out of direct sunlight to prevent it from going rancid. A regular fuel pump system can be connected to the storage system in order to deliver fuel to your farm equipment.

10. Fuel Cost

- It costs Rainville \$1.70 / gal to produce biodiesel. This includes the depreciation cost for equipment over time, and is for the more expensive system using the German extractor. Costs with the less expensive Chinese-made extractor are about the same since you have to factor in the labor costs for monitoring the extraction process.

11. Biodiesel Applications

- Anything that has a diesel engine will run on biodiesel. Borderview Farm uses 5,000 gal of biodiesel per year. Many say that engine runs better on biodiesel than regular diesel since it has more lubricity.
- Producing fuel from virgin vegetable oil is optimum. There can be problems getting the right reactions when using old, used oil.

12. Limitations

- Biodiesel is not intended for year-round use. Biodiesel gels below 35 degrees.

TAKEHOME MESSAGE

- On-farm biodiesel production is economical.
- If you are interested, don't bet the farm, but try a small amount to see how it works for you and if you enjoy it.
- Don't invest in any equipment until you are certain if this is for you.
- In the research/experimental phase, look for another farmer in your area who has the equipment and can press and process small batches for you. You may be surprised at the number of farmers out there who are working on this.