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Development of an Oilseed Food and Fuel Enterprise at Penn State

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Canola and other vegetable oils are familiar labels in the grocery store, but where the oilseeds are grown and how the oil is produced is not your typical Starbucks conversation. And maybe it should be. Oils are in many of the foods we eat, as food preparation uses oil in most baked goods and fried foods. Where does this oil come from and how can it become a locally produced food?

Currently Penn State’s University Park campus operates an oilseed press for the cold-pressing of oils (Fig. 1). The primary feedstock is canola, a black seed about ½ the size of a peppercorn. The oil is filtered and used as fuel in two agricultural machines modified for this purpose. Much of the canola is grown on Penn State farmland near campus and harvested in July and August. While the current use is as fuel, Penn State’s interest is in minimally processing the oil for use in the dining hall fryers. Following the cooking of French fries and tater tots, the used oil will be collected and transferred to the biodiesel processing plant on-campus where a transesterification process will create biodiesel. This biodiesel then returns to university vehicles, including the tractors that grew the canola, as fuel!

How does this process work? Let’s look into processing the grain. If necessary, the grain is first cleaned to remove weed seeds and other chaff that might have been picked up by the combine when harvesting. Cleaned grain is stored in a small bin above the oilseed press, and flows by gravity to the press. Cold-pressed oil is removed by crushing the seeds in a screw type extruder (Fig. 2) and separating most of the seed remnants from the oil. For the oil to be termed “cold-pressed” the temperature of this operation cannot exceed 120 F. Many commercial operations heat the seed and oil to a much higher temperature than those used for cold-pressing.

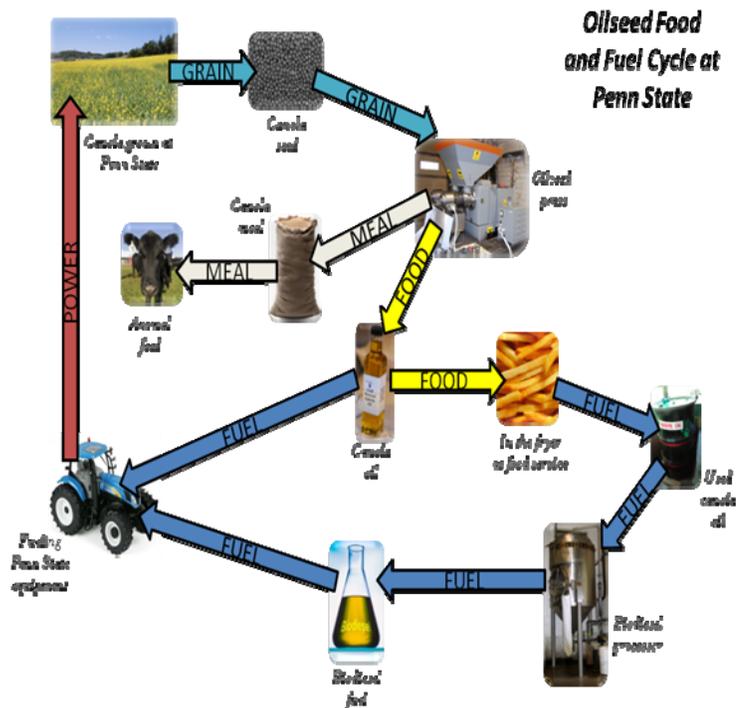


Figure 1: Oilseed Food and Fuel Cycle.

When pressing canola, about 1/3 of the weight of the original seed goes to the oil side and the remaining 2/3 by weight goes to oilseed meal. Oilseed meal contains protein and can be used as a part of the feed ration for animals. A small amount of the fractured seed particles, called foots, go with the oil and require filtering or settling to remove. Filtering can be accomplished by various methods, but we have acquired a small filter-press (Fig. 3) for performing this operation. Our unit is small, and as we grow in production we will need to upgrade to a larger filtering



Figure 2. Oilseed press

diatomaceous earth (DE) is used as a filtering aid to help with this process. DE is a common filtering material that is used in swimming pool filters as well as food processing filtration.

After filtering, the oil is used in a modified tractor and front end loader (Fig. 4) as engine fuel. Over 2,200 gallons of oil have been used by these two pieces of equipment over the past year. These machines use petroleum diesel fuel when starting and when not working hard, and switch to the vegetable oil when working. Overall, these machines use about 85% vegetable oil and 15% petroleum oil.



Figure 3. Filter press

As the process for making the cold pressed oil into fryer oil becomes understood, the university will move toward making a portion of the oil used in the dining halls at the University Park campus. This will create a better awareness among the student population of where food comes from and allow close-to-home discussions of cycles and sustainability.



Figure 4. Case 621E & NH T7060 modified for vegetable oil

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