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## Fueling the farm with homegrown diesel

*By partnering with Extension, a start-up biofuel company found needed resources to successfully create a new model for on-farm biofuel production.*

### Situation

In 2008, the rising cost of diesel motivated three Southeast Colorado farmers to build a biofuel processing facility. Hal Holder, Joel Lundquist and Rick Young located their start-up operation, called The Big Squeeze, at an animal feed yard. The facility crushes oilseed into straight vegetable oil (SVO). It also produces high protein meal, a by-product of the crushing process, that can be fed to cattle on site. The Big Squeeze partners wanted to replicate their model at other feed lots. But first, they needed to fix equipment problems that limited production and test biofuel quality.

### Extension's Response

Perry Cabot met The Big Squeeze operators in 2009 at the Arkansas Valley Farm/Ranch/Water Symposium and Trade Show in Rocky Ford. Cabot is a water resources specialist with Colorado State University Extension and the Colorado Water Institute. He was interested in developing winter canola, an oilseed, as a viable limited irrigation crop for Lower Arkansas Valley farmers. According to Cabot, oilseed could potentially increase local farm (see sidebar). The Big Squeeze was a critical link.

Cabot acquired more than \$56,000 in state renewable energy grants to help farmer-owners Hal Holder, Joel Lundquist and Rick Young construct needed equipment, improve SVO output rate, and test biofuel quality. The Big Squeeze farmer-owners blend the SVO with regular unleaded gas (RUG) at a ratio of three parts SVO to one part RUG. The novel fuel mixture, which they call biofuel-diesel, runs their trucks and farm equipment.<sup>1</sup>

In particular, grants from the Colorado Department of Agriculture's Advancing Colorado Renewable Energy (ACRE) Program helped The Big Squeeze owners overhaul its filtration process, which removes particulate matter and a dark goeey sludge from the oil. Then, they fabricated a 'screw press' in nearby La Junta to refine SVO once it leaves the initial crushing press. Lastly, they purchased a high-speed centrifuge manufactured by an Italian company (Servizi Industriali) to super-clean the oil.

Secondly, Cabot connected The Big Squeeze to CSU's Engines and Energy Conversion Lab (EECL) through additional funding from the ACRE Program. The lab is conducting horsepower, engine efficiency and emissions tests on The Big Squeeze biofuel-diesel. The lab will begin an expanded battery of engine durability testing in 2011.



### The Bottom Line

- Extension helped The Big Squeeze create a viable model for local biofuel-diesel production that can be replicated at similar scales.
- This model has the potential to help farmers diversify their crops, save money, and develop a new rural economy.

### By the Numbers

- Total grant dollars generated by Extension: More than \$56,000
- Amount of biofuel-diesel produced by The Big Squeeze in 2010: 8,000 gallons
- Estimated amount of SVO capable of being produced in the Lower Arkansas Valley: 50-100 gallons per acre

## Results

The first round of biofuel-diesel tests on a common rail engine show a 10 percent reduction in power, compared to commercial grade diesel, at maximum load. Results also show comparable emissions. According to Holder, farmers who use the blend find it a perfectly suitable alternative to diesel since they don't regularly operate machinery at maximum loads. "We have not had a single complaint of any kind. In fact, quite the opposite," Holder says. He reports getting 21 to 22 miles per gallon with his biofuel-diesel compared to 17 miles per gallon with commercial grade diesel.

With an improved production system, the operation is capable of pressing oilseed up to 24 hours a day, five days a week. Its current maximum output capacity is from 500 to 1,000 gallons per day. Since 2009, The Big Squeeze has operated as a co-op. Farmers pay \$50 per ton to have their oilseed crushed into SVO, which they can use however they choose.

Extension, through Cabot, will continue advancing SVO production by evaluating the economics of the whole farm system. The Big Squeeze partners hope to replicate their production model at other feedlots in Colorado and beyond, and expand their flagship co-op concept. "We know enough now that we can size one of these to fit the needs of any feed lot," Holder says.

The Big Squeeze model of locally producing SVO at or near a feed yard offers several economic benefits. First, improved gas mileage could lower on-farm expenses. Second, revenues from the sale of meal to the feed yard offset the per-ton fee to crush seed into oil. Third, the potential to grow canola as a dryland or limited water use crop could increase farm revenues (see sidebar). Future enterprise budgets will quantify the gains farmers can realize by growing oilseed and making biofuel rather than purchasing commercial grade diesel.

In the meantime, Cabot will continue to work with The Big Squeeze by developing decision-making tools that evaluate oilseed crop production on a per-acre and per-farm basis. In the Lower Arkansas River Valley, Extension will continue testing the potential of emerging varieties of oilseed such as camelina, as well as conducting dryland and irrigated winter canola variety trials.<sup>2</sup>

<sup>1</sup> Biofuel-diesel is not biodiesel. Biodiesel is made through a chemical process whereby glycerin is separated from SVO and becomes a byproduct. More specifically, biodiesel is the fuel detailed under the ASTM D6751 set of standards and specifications.

<sup>2</sup> CSU Extension conducts winter canola varieties trials around the state as part of a national variety trial program.

## On the horizon: Canola

With the recent formation of the Super Ditch Company, farmers along the Arkansas River in Southeast Colorado will begin leasing their water to Front Range cities as early as 2014. The Super Ditch is the first of its kind in Colorado and offers an important alternative to 'buy and dry' agriculture, a practice that permanently fallows land and has contributed to economic decline in some rural Colorado communities. Under lease arrangements, farmers retain their water rights and agree to fallow a percentage of their land each year. However, non-irrigated land can still produce dryland crops. Extension, through Cabot and the Arkansas River Valley Experiment Station, will continue testing canola's potential as a dryland crop for at least two more years. With the availability of a local processing facility, as offered by The Big Squeeze, farmers can grow canola and turn its seed into fuel. As a result, the potential exists for farmers to receive revenue from two crops instead of one—water and canola—and fuel their farms with 'homegrown' biofuel-diesel.

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