WASHINGTON STATE UNIVERSITY EXTENSION

# OILSEED PRODUCTION CASE STUDIES IN THE EASTERN WASHINGTON LOW-TO-INTERMEDIATE RAINFALL ZONE

**Washington Oilseed Cropping Systems Series**

WSU PEER REVIEWED

EM048E

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# OILSEED PRODUCTION CASE STUDIES IN THE EASTERN WASHINGTON LOW-TO-INTERMEDIATE RAINFALL ZONE


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## Abstract


Five profiles of farms with experience growing various oilseed crops are presented, with an emphasis on information pertinent to those new to the practice.

# Oilseed Production Case Studies in the Eastern Washington Low-to-Intermediate Rainfall Zone

## Introduction

The low- (less than 12 inches annually) to-interme-diate (12–17 inches annually) precipitation zone of eastern Washington has the largest area of arable cropland in the state (2.3 million acres) and the wid-est range of elevations and microclimates of the four major production zones (Fig. 1). The case study farms in this publication extend from Dayton in the south-east corner of the state to Bridgeport in north-central Washington. Soils are primarily silt loam formed from windblown loess overlying basalt bedrock or loess over glacial material. The climate is arid, with most of the precipitation occurring during the winter months. Snow cover averages 100 days in north-central Washington; the longer period of snow cover can cause snow mold in cereal crops and decrease the growing season to less than 120 days. Wheat is the dominant crop throughout the region, but yields tend to be lower than in the high precipitation zone (i.e., 18–24 inches annually) of eastern Washington. Moisture is the most limiting factor that dictates what crops can be grown. Two-year rotations of win-ter wheat followed by fallow are the most common in the drier areas of this region, while three-year rota-tions of winter wheat, spring grain or broadleaf, and fallow are most common in the intermediate precipi-tation zone. Wind and water erosion are the main environmental concerns in the low and intermediate precipitation zones, respectively.

The following case studies describe how five growers in Region 2 got started in oilseed crop production, the details of their agronomic practices, how they make marketing decisions, challenges and advan-tages they have experienced, and advice for fellow producers who may be interested in trying oilseeds for the first time. The featured growers are Jason Ech-elbarger, Reardan; Curtis Hennings, Ritzille; Bob and Clay Hutchens, Dayton; Steve Swannack, Lamont; and Wade Troutman, Bridgeport.

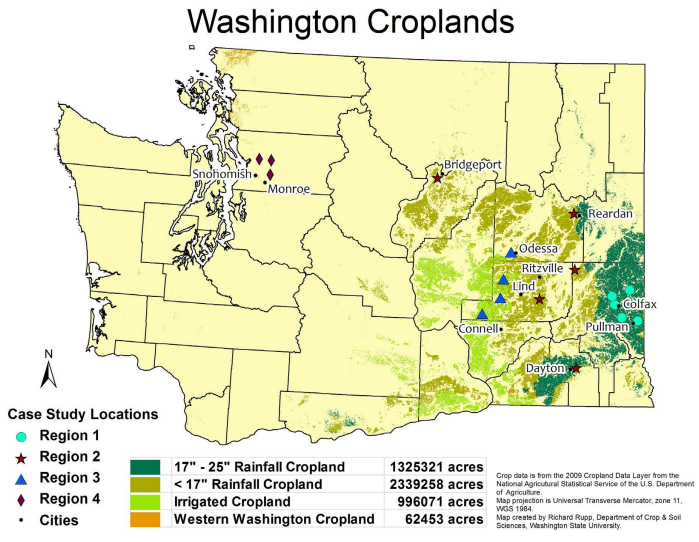


Figure 1. The five producers featured in Region 2 (red stars on map) grow oilseed crops in the low-to-intermediate rainfall zone of eastern Washington.

Figure 2. Oilseeds have been a part of Jason Echelbarger's crop rotations since he began Northface Farms 10 years ago.

## Jason and Denise Echelbarger Northface Farms, Reardan

When progressive yet sustainable farming is men-tioned, Northface Farms north of Reardan is one that sets an example for others in the area. Jason Echelbarger started farming on his own 10 years ago after working as a grain marketing specialist. In addi-tion to his job as the seed plant manager for Reardan Seed, Jason farms 3,000 acres on primarily Athena silt loam soil in a 17-inch precipitation area.

Despite farming for a relatively short number of years, Jason has already experimented with several different crops and rotations to manage weeds and insect pests, and ultimately achieve optimum yield. "I chose to start farming because of the challenges; nothing is ever the same from year to year and I like that diversity. I wanted to try oilseed crops to have something different in what was mainly a cereal rotation," Jason explained (Fig. 2). "Pulse crops just don't do well here, so oilseeds seemed like a good option." A typical rotation is winter canola, recrop winter wheat, spring wheat, spring barley or yellow mustard, and fallow. "I've grown mustard on and off for 10 years, canola for about five years, and flax for a couple of years," Jason said. "I do think oilseeds and biofuels have a future: we have run canola-based biodiesel in all of our tractors without any difference in performance compared to diesel." Jason plants 100–200 acres to an oilseed crop each year and

uses direct seed exclusively.

## Agronomics

**Winter canola:** Jason's early attempts to establish winter canola in this region began with seeding in late August/early September, but he recently tried seeding in July on chem fallow. "It looks like Au-gust is the best time for seeding winter canola based on my experience, but that is still no guarantee of success," Jason commented. He has opted to seed Roundup Ready canola varieties to control problem weeds. He uses a Great Plains disk drill for seeding the canola at a rate of about 3 lbs/acre at a 1-inch depth on 14-inch centers. "A person could probably go down to 2 lbs/acre with a perfect seedbed, but I'm more comfortable with that extra pound of seed," Jason said.

Jason uses a 40-foot wide Concord air drill to apply fertilizer, which he bands before or at seeding on 12-inch centers 4 inches deep at an average rate per acre of 80 pounds nitrogen, 10 pounds phosphorus, and 10 pounds sulfur. When he started planting canola in July rather than late summer, Jason decided to apply all his fertilizer in the fall. "I assumed if I planted the canola earlier than I normally did that the seedlings would not use an excessive amount of nitrogen for fall growth, but soil testing in the spring proved that was not the case," he commented. "Next year (2012) I am going to try a different strategy: minimal starter nitrogen fertilizer with the seed, then in November inject the majority of the nitrogen and starter fertil-izer, and come in again early in the spring and top-dress the balance as dry fertilizer," Jason explained. He is also looking into using a spoke wheel applica-tor to put down some Aqua-N late in the fall.

Figure 3. Growing Roundup Ready canola enabled Jason to con¬trol weeds in a field near his home.

For weed control, Jason applies glyphosate as late as possible in the spring before the canola blooms. "I haven't had to make a fall application of glyphosate with the quick growth of the canola rosette out-com-peting the weeds," Jason observed (Fig. 3). However, for the first time in five years of growing winter canola, aphids needed chemical control in 2010. "Every field of winter canola in this area was sprayed for aphids," Jason said.

With a better stand in 2011 than most of the last five years, Jason decided for the first time to have pod sealant applied aerially in late July to minimize shat-tering. "We didn't end up having any of the usual wind storms this summer, so it's hard to tell if that paid off, but I felt it was worth it since I had a lot of uneven ripening," he concluded.

Jason direct harvests his winter canola with a Case IH combine with a 30-foot header (Fig. 4). His lowest yield has been 1,000 lbs/acre, his average is 2,000 lbs/acre, and his goal is 3,000 lbs/acre.

After several years of growing winter canola, Jason remarked that the 2010–11 crop was the first he con-sidered a full stand. "I've experienced winterkill and other issues with seedling establishment every other time growing winter canola, so I am happy to see a full stand this season. Canola can be a frustrating crop at times, but the rotation benefits and current market price make it worth it to me," he concluded.

**Spring canola:** In 2010 Jason decided to try spring canola after most of the winter canola froze out the previous fall during an atypical 50-year freezing event. He seeded a Roundup Ready variety in early April with the Great Plains disk drill as described for winter canola but at a slightly higher seeding rate of 3–3.5 lbs/acre (Fig. 5). "I wanted to get the canola seeded after the frost-free period, but not much beyond April 20 or the canola would be blooming when it's so hot that it drops flowers," Jason said. He applied anhydrous ammonia with the drill at 100 pounds per acre. "We usually base our fertilizer rate at 10 pounds of nitrogen for every 100 pounds of expected yield, and our yield goal is about 1,100 lbs/acre for spring canola," Jason explained. After scouting the canola every couple of weeks, Jason and his field rep determined by late June that aphid populations were at a threshold level. Warrior aeri-ally applied in early July after blooming controlled the aphids. The yield of 700 lbs/acre was below what Jason expected, but he attributed that primarily to a cool, wet spring followed by dry, hot summer months that may have shortened the flowering and seed set period.

**Yellow mustard:** Jason likes to seed his yellow mustard in April, though May 10 is the targeted final date for seeding any spring crop in the region among area growers. He uses both an air drill on 10-inch spacing and a Great Plains drill on 7-inch

Figure 4. Jason direct harvests canola and mustard on his farm. (photo courtesy of Jason Echelbarger)

Figure 5. Jason has found that a seeding rate of 3–3.5 lbs/acre is sufficient for a good stand of spring canola.

spacing for seeding at a depth of no more than 0.75 inch for best emergence. He applies nitrogen fertilizer as described for spring canola, and herbicide to control grassy weeds in late May, before the mustard bolts. “I also normally apply about 10 pounds of phospho-rus and 15 pounds of sulfur per acre with the drill,” Jason commented.” He direct cuts his mustard in late August, and gets an average yield of 950 lbs/acre.

## Marketing

Jason markets his grains through the local co-op. “We use the open market on canola, which allows us to sell as we choose,” he explained. “With the crusher in Odessa up and running again, we will definitely look there for selling our canola. Otherwise the market is primarily in Canada, and that usually involves a cent or cent-and-a-half just for the trans-portation costs.” He markets his mustard through Montana Specialty Mills out of Great Falls, Montana. “It is important to me to have contracts on many of these smaller market crops like mustard because there is not always an open market to sell them into otherwise,” he said.

## Challenges

Despite trying several different seeding dates rang-ing from mid-July to early September, Jason has been disappointed with the lack of winterhardiness of winter canola. “Winterhardiness ratings for different varieties would be useful over several years to know performance during variable weather situations,” he commented. “With stand establishment, our biggest challenge is figuring out a seeding date where there is still moisture left in clay nobs and hills. That was why we started seeding earlier, as those clay areas that hold too much moisture in the spring can dry out by mid-July.”

For winter canola, insects such as cabbage seed pod weevils, aphids, and flea beetles can get to be a problem if there is not regular scouting during the growing season to determine if threshold popula-tions are present and treatment is necessary. Aphids are the only insect pest Jason has observed in spring canola. Jason and his fieldman begin scouting canola fields May 1, and continue every 10 days until the canola stalks begin to ripen and insect pests will no longer affect yield. Shattering has caused some yield loss, but pod sealant applied for the first time in 2011 seemed to reduce this, Jason said. “Plantback restric-tions have also been a challenge for us, so we usually go one year longer than the label states, especially

on clay soils and after sulfonylurea herbicides." After an unusually wet spring in 2011, Jason saw firsthand that canola does not perform well in waterlogged soils. "I had several spots in one of my fields that did not dry for most of the spring, and by the time I overseeded with some spring canola it was too late to get much of a stand in that area (Fig. 6)."

Weed control is a challenge in Jason's yellow mus-tard. "It would help to have more herbicides labeled for mustard," Jason said. "There are good grass weed control herbicides for mustard, but no broadleaf con-trol options, so pigweed can become an issue. Crop competition is about the only broadleaf weed control available."

Figure 6. Waterlogged soils during a wet spring season on Jason's farm resulted in the loss of canola in those areas.

Figure 7. Attending workshops such as this one in Reardan helps Jason continue to learn about oilseed production.

## Advantages

"I think one of the major advantages of growing oilseeds is [that it allows me] to have a broadleaf crop in the rotation; peas just don't work around here," Jason said. "I have the option of seeding early when things are slow for other crops and that helps spread out the workload. With an oilseed in rotation, I typi-cally see a yield boost of 3–5 bu/acre in the cereal crop following the oilseed crop," he added. "I've also found it is definitely easier to drill on ground where oilseed crops were grown the previous season." Another advantage Jason listed is that oilseed crops are not a host for wireworms, which can be a major problem in cereal grain production in the Reardan area. "In fields where I've got significant weed prob-lems, the option of having Roundup Ready winter and spring canola varieties available provides a weed control advantage for both the oilseed crop and the next crop in rotation," Jason said.

## Advice to other growers

"My first advice about growing oilseed crops is to start small, and get used to the crop before planting too many acres. You will have to pay more attention to the crop. It's a different critter than 'tried and true' cereals, so there is a bit more risk involved. There is a big learning curve—I am still learning after 10 years of growing oilseeds." Jason also encourages first-time growers to participate in increasingly available work-shops and field days (Fig. 7). He finds that it helps to communicate with local growers and see what has worked or not worked for them. "I was talking with a neighbor about harvesting canola, and we both noticed that in areas where the canola is really thick, the yield is not as high compared to areas with fewer but larger plants. We realized that we are doing the right thing with our relatively low seeding rates so there is not so much competition in the rows. We can always bounce ideas off each other and possibly improve the way we raise oilseeds."

Jason also encourages cautious experimentation. When he tried fencing off an area in a winter canola field to let horses graze the seedlings during late summer, he found that they were immediately at-tracted to the tender and green shoots, which they chewed to the ground. "I was worried it would not recover, but the area where the horses grazed had a nice stand." Other parts of the field had significant winterkill. Jason therefore suggested that "if a person wanted to deal with fencing, then grazing could be a good use of winter canola during late summer and early fall when other pasture is dry."

## *Freezing Tolerance in Canola—A Supercool Phenomenon*

Canola will survive subfreezing conditions, but it is anatomi-cally more prone than wheat to freezing damage and winter-kill, which is a major factor in regional canola yield instability. While wheat initiates and maintains its shoot meristematic tissue (crown) below-ground, the shoot meristems of canola reside at the base of the stem above-ground. Thus, while the soil can help insulate the crown of wheat, canola shoot meristems are exposed to aerial temperatures unless there is a layer of 1) snow, 2) plant residue from the previous crop, and/or 3) self-grown insulation in larger canola plants during subfreezing conditions.

Canola shoots can acclimate to subfreezing conditions when plants are exposed to gradual and mild freezing conditions prior to harsher freezing temperatures. Acclimated canola shoot tissue develops a mechanism for surviving subfreezing temperatures during a process called supercooling that involves the buildup of soluble ions (i.e., sugars, inorganic ions, and proline) (Gusta et al. 2004, McClInchey and Kott 2008). Potential management approaches to improve canola freeze survival include early seeding, trapping snow cover in no-till seed beds, and increasing soluble ion uptake with KCl fertilization (Hughes 2012).

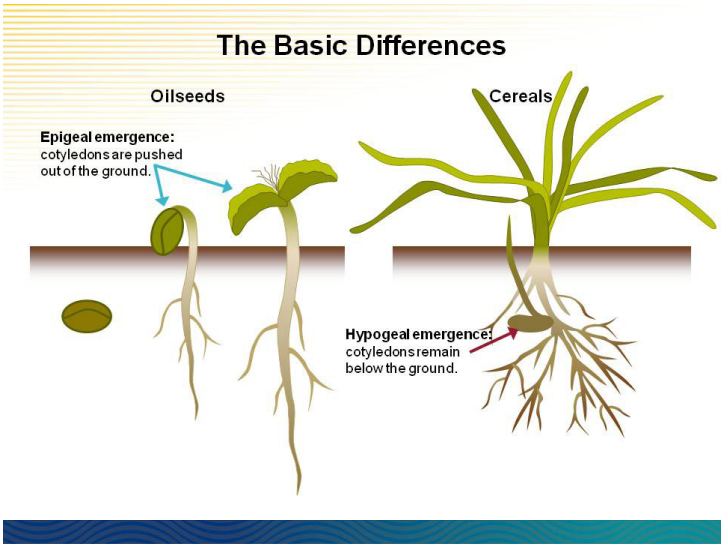


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Figure 8. More than 25 years of growing oilseeds is testament to Curtis Hennings' belief the crops can be utilized in low rainfall fallow cropping systems.

## Curtis and Erika Hennings Ritzville

Third-generation farmer Curtis Hennings makes his home in an 11-inch annual precipitation area just southwest of Ralston, Washington. He and his wife, Erika, farm 6,400 acres of primarily winter cereal, for-age, and broadleaf crops on Ritzville silt loam soils. The topography of their farmland ranges from level to 50% slopes near Washtucna, so tillage and crop selection need to be specific to each field. Growing up on a farm, Curtis remembered hearing about low wheat prices and the need to find other crops to ro-tate in for weed control and to reduce chemical use. That motivated him to begin experimenting with alternative crops, and he continues to try new equip-ment modifications and crop rotations.

Curtis started farming on his own in 1978. In 1984, a WSU Extension educator had winter rapeseed avail-able and encouraged Curtis to try it, so he planted 100 acres. Even with a marginal yield (1,600 lbs/acre) that year, Curtis decided to plant again in 1985 upon the advice of an agronomist and plant breeder at the University of Idaho. This time the yield was good enough (1,850 lbs/acre) for Curtis to want to continue growing rapeseed. By 1986, canola was approved by the FDA for use in canola oil in U.S. markets. With the price for rapeseed declining due to a saturated market, Curtis opted to plant winter canola that fall. "I liked the timing of canola harvest that occurred before winter wheat the following summer." Since that time, he has experimented with multiple oilseed crops, including safflower, camelina, sunflower, soybean, mustard, and winter and spring canola (Fig. 8). "Whenever I try something new I plant it close to a road so more people will see it and ask questions," he said. "Farming can definitely be challenging, but I believe that instead of fearing change or failure, we need to be open to considering new ideas and new crop rotations that can poten-tially revolutionize farming."

### *Agronomics*

A unique part of the Hennings operation is their donation of 30 acres to USDA-ARS and Washing-ton State University in 1995 for multidisciplinary research on various crop rotations and conserva-tion management. The collaboration began when a USDA-ARS research agronomist approached Curtis looking for a place to plant research plots on arable land in Washington's low precipitation zone. "Erika and I felt it was important 17 years ago, and we still do—we need the research out in this area. We learn from it, we learn from each other, and I have ready access to researchers and what they are studying!"

For a field experiment of his own, Curtis seeded Bras-sica napus and B. rapa winter canola varieties side by side during late summer 2010 to see how the two compared throughout the growing season (Fig. 9). "I've grown both types before in different fields, but never next to each other like this," he commented. "The rapa types are typically more winterhardy and less prone to shatter, but yield lower than the napus varieties," he continued. "The leaf shape, margin, color, flowering pattern, stature—just about every-thing about the two are different."

Curtis regularly works with a four-year rotation of winter cereal-fallow- broadleaf-fallow. The winter cereal is either winter wheat or winter triticale, and the broadleaf varies between winter canola and sunflower. He also tried camelina in 2008, and spring canola in 2009 and 2010.

**Canola:** When Curtis plans a winter canola crop, he applies fertilizer with sweeps during the spring of the fallow cycle. He

Figure 9. Curtis planted one variety each of Brassica rapa (left) and B. napus (right) winter canola in the same field to compare performance.

uses either 12 or 13-inch cen-ters at a rate similar to that for winter wheat, with a 5:1 nitrogen to sulfur ratio. Soil tests determine the

fertilizer rate, which is usually about 75 pounds of nitrogen and 15 pounds of sulfur per acre. “I often use a 60-foot wide coil packer (Fig. 10) to set the summer fallow ground tighter before I plant my canola, and base my seeding rate and depth on mois-ture availability,” Curtis explained. He has modified a John Deere HZ714 split packer deep furrow drill for planting canola by taking off every other opener and packer for 28-inch row spacing. “I will keep working on that drill until I get it to perform consistently for planting canola when I need to go deeper to reach moisture,” Curtis said.

With fallow moisture conditions close to the soil surface in late summer 2011, Curtis chose to seed over 500 acres of winter canola at 2–3 lbs/acre in early August with a John Deere HZ616 drill at 16-inch row spacing. When soil moisture is at 4 inches deep, his seeding rate may be as high as 7 lbs/acre. “Unfortu-nately, the soil moisture in both 2007 and 2009 just wasn’t there to get the canola seed to emerge,” Curtis commented. In 2007, he replanted the canola field to winter wheat that fall. In 2009 Curtis seeded a Brassica rapa variety to see if it would perform better than the B. napus variety that failed in 2007. “The B. rapa vari-eties are typically tougher under poor environmental conditions and mature earlier than the napus ones, but most of the acreage again did not survive with the low soil moisture,” Curtis explained. Unusually heavy rainfall during late summer 2010 caused soil crusting and poor emergence in a newly-seeded winter canola field, prompting Curtis to overseed with additional winter canola using a double disc drill a few weeks later. Planting dates in 2010 varied from July 23 to September 6. “I seed canola based on soil moisture and what I need to get done with other crops at that time, so the planting window can vary widely.”

Figure 10. Curtis uses a coil packer to prepare a firm seedbed prior to planting winter canola.

When canola pods begin to change from light green to yellow, Curtis has pod sealant aerially applied to reduce shatter loss. “There was one year that I didn’t use the sealant and I was very sorry,” he commented. Next is direct harvesting, and either storing on-farm until it sells, or hauling directly to a regional eleva-tor. Despite widely varying yields of winter canola over the years (1,100–3,000 lbs/acre), Curtis believes it is more of an overall consistent performer than spring canola (800–1,400 lbs/acre). Yield estimates from the 2011 winter canola rapa versus napus va-riety comparison were 2,000 lbs/acre and 2,500 lbs/acre, respectively.

**Sunflower:** Curtis has conducted his own research on sunflower seeding rates for a couple of years (Fig. 11). “Sunflowers are a crop that thrives in the heat, and we’ve got that!” He applies fertilizer the previ-ous fall, and Spartan (sulfentrazone) before planting in late spring following fallow to control Russian thistle, marestail, and kochia. He uses the same drill as for canola to plant sunflower, with a seeding rate of 2–3 lbs/acre to achieve 15,000–17,000 plants/acre. “I’m shooting for a plant every three square feet with that seeding rate,” Curtis explained. A healthy resident ladybug population has kept pests at bay without the need for pesticide applications.

Curtis usually direct harvests his sunflower after frost, which can be as late as November. His combine settings include opening the concaves as far as possi-ble, and turning down both the rotor and fan speed. One equipment change Curtis would like to try in the future is adding sunflower pans to the header to catch more of any seeds or heads that would other-wise fall on the ground.

**Camelina:** Curtis planted camelina for the first time in 2008 following winter wheat on some of his more marginal, sloping ground along Highway 26 near Washtucna (Fig. 12).

Figure 11. Sunflowers have performed well in the hot summer months on Curtis’ farm.

He broadcast the seed in March, and then ran his coil packer over it. Soil tests showed adequate nitrogen in the top three feet, so he did not apply fertilizer. “Looking back, I should have put on some, because most of that nitrogen must have been too far down in the profile for the seedlings to access. They didn’t have a lot of vigor for a long time, and that likely made a big difference in yield. We also had Russian thistle in a lot of the field, which made harvest a bit more challenging.” The extremely small size of the camelina seed required multiple adjust-ments with screens, fan speed, and ground speed. Despite poor yields of only 300 lbs/acre, Curtis is not discouraged from trying camelina again. “I never try anything just once,” he said. “You never know what a crop can really do from just one year’s experience.”

## Marketing

Most of the marketing success for Curtis has been by using the phone, speaking directly with buyers who may be interested in a particular oilseed crop. “I believe that personal contact is so important. For example, like other oilseed crops, sunflower has several end uses—[dairy cow] meal, [food grade] oil, and birdseed—so finding a market to sell it is not dif-ficult, but does require some effort and time,” Curtis explained. He uses Connell Grain Growers for his sunflower seed. For safflower seed, California is the largest market, while the local birdseed market is an-other option, particularly for white-seeded varieties.

Curtis noted the change in canola markets with the opening of a crusher in Odessa in 2008. “Really the main market we had until then was Lethbridge, Al-berta. Now the local guys are becoming more com-petitive with outside markets, and I certainly believe in supporting the local ones.”

Figure 12. The 2008 camelina crop did not yield well due to severe drought and other factors, but Curtis still may try it again in the future.

Curtis does not usually contract oilseed crops before planting, but prefers to store the seed and market it after harvest. That strategy was put in place with canola seed harvested in 2010, which was stored until being sold to AgVentures NW in April 2011 for a better price than was available in 2010.

## Challenges

“Stand establishment, by far, is our biggest chal¬lenge in dryland canola production,” Curtis stated. He would like to see development of a winter canola variety that could be planted in mid- to late-Sep¬tember and still make it through the winter, either with faster early growth to reach rosette stage, or just increased winterhardiness.

Curtis is working on his own, and with USDA-ARS researchers, to find the best drill modifications to address the amount of soil that covers the seed row in his canola fields. Ideally, the soil needs to stay out of the furrow after it is spread there by the shovel openers. “When the moisture has been adequate, I’ve planted canola 4–5 inches deep and still had good emergence, but only when that surface soil tempera¬ture is not too hot,” Curtis reported. “If the seedlings do emerge with surface temperatures close to 120 de¬grees, the heat of the soil just burns the cotyledons.”

Another challenge Curtis found was efficiently har¬vesting large canola plants. “With the canola usually being 6–7 feet tall by harvest, I ended up installing a full finger auger on the header to help the amount of material stay under the auger and keep it feeding through the feeder house, and that seems to work better.”

Curtis continues to struggle with chemical restric¬tions. “To get on a rotation with a broadleaf crop, we are going to have to plan ahead far enough on our chemical rotation to make it work. I would like to see rotational timing studies with combinations of crops and chemicals; we need to know what is the best cycling when we have several oilseed crop options.”

## Advantages

Of the successes Curtis has experienced with oilseed production, the most significant is the consistently higher yields of wheat after growing canola. “When I see a 20–27% yield increase in wheat following canola, that’s gravy! I definitely consider growing canola a successful venture when four out of five years I’ve made more money off of canola than win¬ter wheat.” In addition, a different crop in rotation has significantly improved grassy weed control and broken disease cycles.

Curtis has observed greatly reduced runoff in winter canola stubble, and reduced erosion in spring if there is a good winter canola stand. “Another thing I’ve noticed is that both winter wheat and winter canola draw moisture to six feet. I’ve pulled a four-foot-long pencil-sized canola taproot in the spring from August-seeded canola,” Curtis said. He also reports the taproot of canola has noticeably improved soil tilth. “Oilseed crops really could help the farm economy, and if it drives changes in rotations, that is a major benefit. I’m more excited about farming now than ever with the variety of crops available, and especially the improvement in yield that can result in a better bottom line,” Curtis remarked.

## Advice to other growers

“Start small; you don’t have to start big with some-thing new,” Curtis advised. “Be sure not to make fallow to deep, know your field chemical history (no sulfonylurea [SU] or imidazolone herbicides) for several years, and soil test annually. I experienced a situation in a field with a pH of 8.4 where I planted canola six years after an SU was applied, and not one of the canola plants survived. You really need to watch how soon you can go back in with an oilseed to a field like that.”

Curtis also suggests that growers wait to make their crop rotation decisions until fields can be assessed for soil water availability, weeds, and chemical history, and the market for a particular oilseed crop is known. He encourages attending field days and workshops to “see what others are doing, make contacts with others interested in the crops, gain experience, and take advantage of observing production in different locations” (Fig. 13). In the 10–11-inch rainfall zone, Curtis recommends trying safflower, which can have a taproot up to 14 feet long that accesses deep soil water, or camelina, a crop suited to marginal crop-land and environmental conditions. He believes once there are more herbicides labeled for camelina, and FDA approval for camelina use in dairy feed, there will be more interest in growing the crop.

Figure 13. Curtis attends field tours to continue learning more about new varieties and growing oilseed crops.

As far as insect pests, Curtis advises scouting oilseed crops during the bloom period, when treatment is critical if a population is above threshold levels. “I have seen diamondback moths (Fig. 14), aphids, and even flea beetle on canola before winter, but that isn’t a huge concern to me because a lot of that leaf matter will die off over the winter,” he commented. Curtis has found that a resident ladybug population is the most efficient control method for aphids.

Figure 14. Curtis has observed diamondback moth larva (left), pupa (center), and adult (right) on canola in the fall and spring, but populations are not at threshold levels.

## Winter Canola: When and How Much to Seed

Common questions among producers in the 10–11-inch rainfall zone in Washington include optimum timing and rate of seeding for winter canola. Dr. Frank Young, USDA-ARS, has conducted research in this area since 2007 comparing several planting rates and dates. In one study, a seeding rate of 4 lbs/acre yielded 1,340 lbs/acre and 5 plants/ft2, while a seeding rate of 8 lbs/acre yielded 1,240 lbs/acre and 12 plants/ft2. The plants seeded at the higher rate competed with each other, resulting in a reduced yield. With seed costs as high as $10/lb, it is not economical to double the seeding rate for insurance of a stand.

In several seeding date studies, Dr. Young has con-cluded that adequate soil moisture and expected daytime high temperatures below 85°F 5–10 days following seeding are the two most important guidelines. In the low rainfall areas these conditions typically occur after August 1. However, it is not recommended to seed canola after September 1, as the canola plants will not be large enough to survive the winter.

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# Bob, Anita, Clay, and Rachel Hutchens HG Etc, LLC, Dayton

Figure 15. The Hutchens family farm is located northeast of Dayton, Washington.

Massive wind turbines visible from Bob and Anita Hutchens' farm are symbolic of the progressive farm-ing methods that have been part of their operation for many years (Fig. 15). Bob and his younger son Clay are third and fourth-generation farmers in the Dayton area near the Blue Mountains in southeast Washington. Athena and Palouse silt loam are the predominant soil types on the farm. A wide range in field elevation (1,600–3,500 feet) and annual pre-cipitation (14–28 inches) typically results in a three to four week difference in growing seasons between locations. The Hutchens also have to deal with deer and elk grazing their crops, particularly in the higher elevations.

Despite these environmental and physical challeng-es, the Hutchens have developed a system that works for them, including implementing direct seed or reduced tillage on a majority of their 2,800 acres (Fig. 16), and trying out different oilseed crops in various rotations with traditional crops on a small portion of their land. After attending a direct seed conference in 1995, Bob decided to try growing mustard in place of peas as a deterrent to the elk that were causing significant yield loss in the peas. That experiment worked fairly well, and since then he and Clay have also tried growing spring and winter canola, and have been pleased overall with the results. "We like the idea of developing a local market for both the oil (for biodiesel) and the meal from oilseed crops, and hope we will someday see that happen."

## *Agronomics*

**Yellow mustard:** Bob and Clay prepare their fields for yellow mustard by applying Roundup preplant. Based on soil tests, they fertilize at planting with a per acre average of 75–80 pounds nitrogen as aqua ammonia and sulfur as Thio-Sul at one-fifth the nitrogen rate. Using a seeding rate of 8–10 lbs/acre at 0.25–0.50 inch deep, they usually plant mustard on their lower elevation ground the first week of April, and one month later for the higher elevations. They control grasses by applying Select before the mustard bolts.

Due to unusually heavy spring precipitation in 2009, Bob and Clay delayed seeding mustard until May 25 and only planted their higher elevation field. They used a John Deere 750 drill and applied fertilizer at the same time. "It was still pretty wet in some spots, so the furrow wouldn't even close over the seed," Bob commented. Both depth control and seeding calibration were also problematic in places. "We ac-tually had too thick of a stand in some areas, and the plants competed with themselves, which may have hurt our yield a bit," Bob explained. However, Clay felt that 950 lbs/acre "wasn't too bad for that higher elevation." Cold, wet weather again prevented the Hutchens from planting the 2010 mustard crop until late May, but this time including their lower eleva-tion paid off. Yield varied widely from the clay soil at higher elevation (300 lbs/acre) to the lower eleva-tion Palouse soil (1,100 lbs/acre). Similar weather in spring 2011 delayed planting of mustard until early June, when they used a Flexi-Coil 5000 air direct seed shank drill for the first time (Fig. 17). After modifying the drill with a hillside, or compensating, hitch to allow the drill to stay square with the hill on steeper slopes, Clay concluded that he and Bob were "very happy with the consistent, evenly placed seed with this drill on both the hillsides and flatter areas." The Hutchens use both a John Deere 9600 combine with a 30-foot header and a Case IH 1470 combine with a 25-foot header to harvest their mustard in early September.

**Winter canola:** The Hutchens first inserted winter canola into a three-year rotation following a spring grain and fallow, hoping that it would flower by early June and mature in July before the hottest tem-peratures occur that could impact the yield of a less mature crop. They chose marginal ground to try the canola, as the winter wheat grown there previously would usually burn up before it had a chance to ma-ture. They set the drill with the same row spacing as for winter wheat (10 inches), and paid special atten-tion to proper drill calibration

Figure 16. Bob and Clay have converted the majority of their acreage to direct seed, including this field of spring canola following a winter wheat crop.

Figure 17. After trying several different drills for oilseeds, Clay modified a direct-seed shank drill in 2011 to plant mustard and canola.

given the small size of the canola seed. They applied fertilizer at similar rates used for winter wheat or winter barley. “I use a 5:1 nitrogen to sulfur ratio, and apply all the fertil-izer in the fall. If I wait until spring to fertilize it may be either too wet to get in there early enough, or if I could get on the field in the spring, we may end up with minimal rainfall for the rest of the season,” Bob explained.

Like any crop in a dryland system, winter canola has varied for the Hutchens in yield and quality every year, primarily due to weather differences. The cano-la was successful the first year they tried it, yielding 2,900 lbs/acre. “Our lowest winter canola yield was 1,600 lbs/acre, so there are definitely year-to-year variations we just need to be ready for and deal with as it happens,” Bob said. “We’ve lost winter canola in late October to a freeze, and with minimal to no soil moisture in late summer 2009, we could not justify planting winter canola that year. I always say the weather can make you smart or make you dumb!”

**Spring canola:** Bob and Clay grow Roundup Ready spring canola in a four-year rotation of winter wheat-winter wheat-spring grain-spring broadleaf (canola, mustard, or peas). In recent years they have seeded spring wheat due to a poor barley market. “Having the Roundup Ready canola really, really reduces weed competition, and we’d be in trouble if we didn’t have that as an option,” Clay explained (Fig. 18). If fields are accessible, they plant canola in mid-March at a rate of 4–5 lbs/acre 0.5 inch deep depending on where the soil moisture line is. “Historically we have seeded at 6–6.5 mph, but the last two years we slowed it down a bit for better seed placement. We go slower on the hillsides where depth can be a prob-lem,” Clay noted. They shank fertilizer in at a 6-inch depth at planting as described for mustard.

In 2010, the Hutchens split their spring canola acreage between two fields with different soil types, and varied the planting dates (2–3 weeks apart) and depth (0.75 inch vs. 0.5 inch) to compare growth, de-velopment, and yield during the season. The earliest seeded canola was plagued with flea beetle problems.

“We are thinking perhaps since emergence was so slow due to the cold wet weather after we planted it, that the seed treatment lost some of its potency by the time emergence occurred,” Bob recalled. “Also, after emergence the canola grew very slowly because of [continued cold wet] weather, and could not out-grow the bug pressure.” Conversely, the later seeded canola had no insect problems early. Bob and Clay sprayed both fields for aphids when the canola was near maturity. The early seeded canola yielded 2,172 lbs/acre, while the later seeded canola yielded 2,542 lbs/acre.

The Hutchens seeded their spring canola later than usual in 2011 as well due to cold, wet weather delays. They used the same Flexi-Coil 5000 shank drill used for mustard, and were again pleased with the results (Fig. 17). Although there were indications of residual herbicide effects during early growth stages, by the time the canola flowered, the damage was not as evident. At full bloom there were a few aphids and curled pods from thrips (Fig. 19), but not at levels high enough to warrant spraying insecticide.

The Hutchens prioritize harvesting their canola as soon as it is ready to reduce the risk of shattering (Fig. 20). Bob and Clay direct harvest the canola with the same two combines and headers used for mustard. “We close the bottom sieve tight, open the concave a bit compared to wheat, and turn down the cylinder and wind speed to reduce seed loss as much as we

Figure 18. The ability to grow Roundup Ready canola in rotation with grains has significantly improved weed control on Bob and Clay’s farm.

can." Clay also checks in front of and behind the header, and behind the combine to minimize seed loss. "I have an old broomstick that I've at-tached a cup to, and it helps to have someone walk along and catch the chaff to check for seed loss there too, and make adjustments as needed."

Figure 19. Curled pods on a few plants indicated the presence of thrips in Bob and Clay's 2011 spring canola.

Figure 20. Depending on the weather, canola pods can turn from green to brown quickly, so Bob and Clay try to make sure all equipment is ready for harvest to avoid excessive shattering.

## Marketing

When the Hutchens first grew mustard they con-tracted through a Montana-based company, but they now go through McKay Seed in Moses Lake for condiment end-use. Bob and Clay haul the harvested seed to Dayton, where McKay Seed loads and hauls it to Moses Lake. Mustard contracts have been very favorable recently ($0.30 to $0.40/lb), except in 2010 when market demand was not as high. They usually purchase canola seed through Primeland Coopera-tives in Lewiston, Idaho.

The Hutchens have their own on-farm biodiesel production equipment, so harvested canola seed usually remains on the farm to potentially process into fuel. However, if the Hutchens still have grain stored on-farm and the market for canola goes up enough to turn a profit, selling the seed will take precedence over making biodiesel from the seed. "We need to farm first, then deal with the biodiesel," Bob emphasized. "When we do have meal available after processing the canola, we've never had a problem getting rid of it—there's always someone nearby that is more than happy to buy it for their livestock. A couple years ago when alfalfa was so high, a neigh-bor bought canola meal for his cattle, and when he took the cattle to market they graded really high. "

## Challenges

Similar to other growers in Region 2, Bob listed seed-ling establishment as the top challenge with both winter and spring canola. For the winter canola, soil moisture in the fall can be insufficient for seed ger-mination, and getting the plant to the rosette stage before winter can be difficult if emergence is too late.

"We need a more hardy winter canola that doesn't have to be planted so early, but is still able to make it through winter," Bob commented. Variable spring-time seeding conditions can also be a challenge in the Dayton area.

Plantback restrictions based on previous herbicide use pose another challenge for the Hutchens. "When we can still see old strip boundaries that likely were from previous chemicals more than six years ago, it makes us wonder how much higher our yields could be. We would really like to see development of Pursuit-resistant brassicas and Roundup Ready Pursuit-resistant canola," Clay said.

Figure 21. Bob points out a clay nob in one of his winter canola fields where the soil structure improved after growing canola.

## Advantages

"Oilseed crops have definitely improved my poorer soils, such as on hilltops and steeper slopes," Bob concluded. He added that "we discovered the deeper taproot of mustard improved the soil structure on clay nobs that had been severely eroded and had very poor production potential, and that has helped subsequent crops" (Fig. 21). Between the healthy earthworm population that has resulted from chang-ing to direct seed, and the root growth of the oil-seeds, the difference in the soil structure has been "remarkable." Grassy weed control has improved considerably too. The Hutchens also attribute better control of deer and elk feeding to including mustard in their rotations. "When we grew both mustard and canola, the deer left the mustard alone, but destroyed the canola," Clay explained. The Hutchens have noted increased wheat yield following canola, but only if moisture is adequate for the wheat crop.

With their on-farm facility for producing biodiesel from canola, the Hutchens have been able to try biodiesel in their tractors, combines, and pickups. "When we ran a 20% blend in our equipment a few years ago, I thought the machines ran cooler, per-haps from the increased lubricity of the biodiesel. We had to change a few fuel filters, but that's expected with biodiesel," Bob said.

## Advice to other growers

"Recognize the importance of stand establishment, and take the time to be precise enough to get a good stand," Bob urged. "Drill calibration is critical, and I would say to start with a small acreage, and then decide if you want to expand the use of oilseeds on your farm (Fig. 22). Watch for insect pests, and if you see much at all, you need to consider doing some-thing about it, or the end results could be devastat-ing." In addition, he recommends annual soil tests to determine optimum fertilizer application rates for each field.

Figure 22. Bob and Clay encourage first-time oilseed growers to try a small acreage, and be prepared and willing to dedicate time and effort toward learning how to grow the crop.

Bob also advised that growers "keep in mind the ben-efits of rotation—you need to trust in the long-term potential advantages of growing these crops. Yes, yields will vary from year to year, but keep the big picture in mind. I guess the bottom line is, don't do it if you don't want to do it—you need to put in the effort and really try to make it work," Bob concluded.

## Canola-based Biodiesel Compared to No. 2 Diesel

Utilizing canola-based biodiesel in farm equipment and vehicles is not a widespread practice in Wash-ington, yet there are reports of engine performance similar to or better than No. 2 diesel, as on the Hutchens farm. While energy output for No. 2 diesel averages about 8% greater than B100 biodiesel, the energy output from No. 2 diesel is much more vari-able than from biodiesel (Canola Council of Canada n.d.). A higher cetane number (measure of self-igni-tion quality) in most B100 biodiesel compared to No. 2 diesel (i.e., > 47 vs. 42–44) indicates that engines running on B100 will start easier and run quieter (Conley and Tao 2006). In addition, the greater than 80% mono- and poly-unsaturated fatty acids, and less than 10% saturated fatty acids found in Washington-grown canola impart a lower fuel cloud point and cold filter plug point in biodiesel, resulting in increased fuel efficiency. Canola-based biodiesel also has a lower iodine value than No. 2 diesel, which results in fewer fuel deposits that can shorten the life of an engine. "When switching to biodiesel, run a tank through and then plan to change the fuel filter," recommends Joe Thompson, biodiesel lab manager at the University of Idaho. "Biodiesel will typically remove deposits and can plug a filter during that first tank. After that, keep a spare filter on hand to change if necessary."

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# Steve and Ann Swannack Lamont

Figure 23. Steve Swannack considers canola, mustard, and other oilseeds to be "opportunity crops" that can be very successful given the right growing conditions.

Steve Swannack is a fourth-generation farmer in Whitman County near Lamont, Washington, where he farms 2,200 acres. The soils are Walla Walla and Athena silt loams with slopes up to 30%. The steep-est slopes are out of production and in the Conser-vation Reserve Program. After seeing the effects of erosion, particularly on sloped ground due to con-ventional tillage, Steve started incorporating direct seeding in his operation almost 20 years ago; he now uses it exclusively. With recent annual precipitation well below the average 14 inches at only 10 inches, direct seeding has been that much more important to Steve in conserving moisture.

In addition to changing tillage methods, Steve grows a variety of crops, including many types of wheat, barley, triticale, peas, sudangrass for hay, corn, and oilseeds. Steve emphasized he doesn't have a typical rotation—he likes to keep trying different crops and rotations to find the best fit for the particular envi-ronmental and economic conditions of each year. However, oilseed crops have become a regular part of every rotation. "Oilseed crops and biofuels are part of the package; we have to cut some of our ties to the Middle East, and that's one way we can do it. I think on an individual basis we may be able to get closer to independence. When my granddad farmed, a third of the acreage went to feed the horsepower—maybe we need to get back to more of that kind of picture where part of the place has to go to feed the horsepower."

Steve first tried growing winter canola 20 years ago to see if it would work in his area as an alterna-tive to the traditional winter wheat-fallow rotation. inconsistent to continue growing the crop on a regular basis. Steve's favorite term for winter canola is "opportunity crop," one to use when the conditions are just right for growing it successfully (Fig. 23). In more recent years he has experimented with spring oilseeds, including canola, sunflowers, and mustard, and has chosen mustard as his favorite oilseed to grow as long as there are contracts available.

**Agronomics**

**Yellow mustard:** Steve plants Idagold yellow mus-tard, a variety developed at the University of Idaho, in mid-April. He prepares the field by spraying glyphosate on winter wheat stubble in late October, and again in early April. He applies fertilizer in the spring at planting. Based on soil test results, his aver-age per acre application rates are 65 pounds nitrogen, 15 pounds sulfur, and 3 pounds phosphorus using anhydrous, THIO-SUL, and 10-34-0, respectively.

Steve likes to seed his mustard at 0.5–0.75 inch deep at about 4 mph, depending on how heavy the previ-ous crop residue is. He used a 36-foot wide Conserva Pak drill with a Flexi-Coil air cart for the first time in 2011 to plant the mustard (Fig. 24). "The drill pulled real nice when I seeded wheat into fallow, so I was hoping the mustard would go just as well," Steve said. "I was mostly afraid of the tremendous straw row put out by my old combine last year from winter wheat, and because of that I cross-harrowed the field twice. I was able to cut my seeding rate from 10 to 7.5 lbs/acre, and while the initial emergence seemed spotty, it quickly filled in and looked pretty even."

Figure 24. Steve direct seeds mustard into winter wheat stubble.

Steve controls wild oats with a grass herbicide (Select) applied with a 70-foot Brandt sprayer before the mus-tard bolts. The mustard crop is usually in full bloom by mid-June, at pod-fill in July (Fig. 25), and ready to harvest in August. Steve direct combines the mustard with a Case IH 2388 at approximately 4 mph. Despite "miserable yields" for mustard ranging from 350 to 1,300 lbs/acre the last 12 years, Steve said he is "still learning, and willing to try growing it again." Steve noted that during the 2011 growing season he saw a "definite topographic response with the south and west sides doing much better than the east and north sides of the hill, I assume because of solar heating and the cold, late spring." With a later planting date than most years, the 2011 crop yielded 847 lbs/acre, consid-erably below the 1,000 lbs/acre Steve was expecting.

Steve applies Firestorm as a post-harvest burndown 2–10 days after harvesting his yellow mustard to stop Russian thistle seed set before a fallow year. "That treatment makes the chemical fallow much easier without the thistle population, and also stops the this-tle from using soil moisture that's left," he explained.

**Winter canola:** "The first year I grew winter canola I planted it August 30 and got a good yield (2,400 lbs/acre). The second year I planted August 1, and also got a decent yield (1,800 lbs/acre). I decided the third year to plant even earlier since I had moisture, and that went in July 20. With that initial moisture I had a tremendous stand with huge leaves, until about three weeks later when I discovered the undersides of the leaves were just covered with aphids," Steve recalled. Despite spraying three times, his yield that year was only 1,100 lbs/acre. He thinks moisture stress from no rain after planting increased the insect problem.

Steve initially used a conventional hoe drill to direct seed the winter canola at 8 lbs/acre on 16-inch row spacing. He applied nitrogen at 70–80 lbs/acre and sulfur at 8–10 lbs/acre at planting. Based on soil tests, the next year he increased the sulfur to 12–15 lbs/acre, and added a small amount of phosphorus. Steve also switched to a Case IH Concord air drill to seed his winter canola.

Figure 25. Mustard pods fill during July on Steve's farm.

"When I used the conventional drill I could never get the seeding rate below 8 lbs/acre," Steve explained. "With the Concord I could seed winter canola at 3.5 lbs/acre. That's plenty, based on what came up after I first used it. A week after planting, the bottoms were coming and looked great, with a plant every 2–3 inches in 10-inch row spacing. Unfortunately nothing else ever emerged, so I reseeded to winter wheat."

Steve always sprayed his winter canola for cabbage seedpod weevil, and aphids if necessary. He com-mented that "when there is a good stand of winter canola, weed control is a non-issue, including cheat-grass. The canola is very competitive."

Harvesting winter canola was a learning experience for Steve; he learned right away to use a slower com-bine speed than for small grains. "The newer variet-ies don't have as big of stems as when I first grew winter canola, but at that time I had a tremendous amount of material to get through the combine, so I was harvesting at less than 2 mph," Steve explained. If environmental and economic conditions are favor-able in the future, Steve may try winter canola again.

**Spring canola:** After the inconsistency in winter canola performance, Steve decided to try spring canola, and grew it for four years. He applied fertiliz-er in the spring with a standard shank machine using two tanks and two delivery hoses, one for anhydrous and one for THIO-SUL. He planted the spring canola with a hoe drill. "I was shooting for a seeding depth of 0.5–0.75 inch, but I had poor depth control with that drill," Steve explained. Over the four years, yield averaged 1,100 lbs/acre. Steve stopped grow-ing spring canola in favor of yellow mustard 12 years ago. "Insects were a real problem in my spring canola," he recalled. He was applying insecticide aerially, which only increased the cost of produc-tion. "Mustard had less management involved, and I didn't have to worry about insects," Steve explained.

## *Marketing*

Steve contracts his mustard with McKay Seed (Moses Lake) for condiment end use. He hauls the seed to the co-op at Revere or Lamont for storage (Fig. 26), and then "McKay takes care of the transportation after that," he explained. In 2009 Steve was able to contract his mustard crop at $0.32/lb, which was enough to cover input costs. Mustard contracts for 2010 were extremely limited, so Steve decided not to grow it. The fluctuating mustard market took a posi-tive swing again in 2011, and he was able to contract for $0.34/lb. "I will definitely grow mustard again in future years," Steve said.

Figure 26. Dedicated storage for Steve's mustard seed is available at the nearby Revere elevator.

## Challenges

Stand establishment for both fall and spring oilseed crops is the main challenge for Steve. "I still don't feel like my stand is as good as it should be, so I'm still struggling with that," he explained. He specifically noted the difficulty of being able to control planting depth. "When I used conventional hoe drills to direct seed, it was not a good combination! With the air drill I am getting better depth control, but I'm definitely still learning. I think the consistency can be improved upon with the use of air diffusers in the seed lines at the openers. That should eliminate seed bounce and allow the seed to fall by gravity into the furrow."

Steve believes that research addressing winter canola stand establishment is critical. He sees the potential for successfully growing winter canola throughout the low-to-intermediate rainfall zone if researchers can de-velop a variety that can be planted later and still make it through the winter as a smaller plant, or one that can be planted earlier in the summer. "We need to be able to plant into moisture and [avoid] surface soil temperatures that burn the cotyledons as the plant emerges," he explained. Steve suggested that a growth regulator targeted at early-seeded winter canola might resolve some of the problems he's experienced. "If I was to plant earlier and get good stand establishment, I would like to see if a growth regulator would then slow plant growth enough to reduce both moisture uptake and bolting before winter."

Insect problems in Steve's spring canola led to his decision to stop growing this oilseed. He noted both the expense of an airplane to apply pesticides and not wanting to use another chemical. "I was cutting maybe 1,000 lbs/acre and getting ~$0.07/lb for the canola, so it just wasn't worth it."

With mustard production, Steve has largely been able to overcome his primary challenges of when to plant the crop and apply wild oat control. Until late 2009 he rented a drill, which limited planting date options. Now that he owns a drill, the flexibility to plant when soil and temperature conditions are most conducive to establishment is much greater. "As far as wild oat control, I think the timing on that is critical to not hurt the mustard, and that's not always easy [because of variable] weather conditions. I've learned through trial and error that I need to get the oats sprayed before bolting and flowering, or the mustard yield is negatively affected," he explained.

## Advantages

"It didn't matter what crop I raised following winter canola, it had better results than a crop following winter wheat," Steve said. He also listed the advan-tage of being able to use winter canola as a winter rotation crop if stand establishment is adequate. "In some years I'm forced into a two-year rotation, which I really don't like, but canola can have a fit there when I can get it established." Another advan-tage Steve discovered was that "canola meal is a great feed source—I fed quite a lot of it to my hogs as a high protein supplement."

After growing mustard for several seasons, Steve said "I like what the mustard does to the soil, especially the surface, better than a cereal. The surface seems more granulated and friable when I come back in after a chem fallow and seed to winter wheat, even with low mustard yield before the fallow period." He also appreciates being able to leave mustard in the field when it is mature because it doesn't shatter like other oilseed crops.

Steve has seen significantly improved grassy weed control with all the oilseed crops he's tried. "Oilseed crops in a three-year rotation on my farm are particu-larly valuable in controlling wild oats, goatgrass, and cheatgrass that are common in the traditional wheat-fallow rotation in this area. If I can raise an oilseed crop for a profit, I will raise it."

## Advice to other growers

In addition to starting oilseeds on an easily manage-able portion of land such as 20–50 acres, Steve feels it is critical to understand the chemical history of each field and what current chemicals are labeled for use in each crop. "I had the unfortunate experience of learning about the effect of herbicide carryover on spring canola. I hadn't used long-residual chemi-cals since Glean went out of favor. However, I was persuaded to use Amber one year, and four years later my spring canola had witches' broom (aster yellows disease symptoms)."

As a result, Steve encourages producers to ques-tion their fieldmen: “What windows will I close if I use that chemical? What variety will work in my area? How do I determine when or if I need to apply chemicals?” He’s also found it helpful to ask univer-sity researchers questions during the growing season. “One year when I grew mustard, some plants had pods with a purple color to them, so I contacted folks at WSU and UI about it (Fig. 27). I learned that the purple could be due to a number of factors, none of which were serious problems.”

Lastly, marketing is an important component of production. “I always watch both the markets and weather before making a decision to plant an oilseed crop,” said Steve. “I like to have my oilseed crops contracted when I put them in the ground or shortly afterwards.”

Figure 27. After consulting with university researchers, Steve learned that the purple pods in his mustard are naturally occurring.

## *Canola Residue Management*

The wheat-summer fallow cropping zone is susceptible to dust storms, causing soil loss, reduced visibility, and poor air quality (Papendick 2004). Growing canola in dryland wheat-based crop rotations could help reduce wind erosion and PM-10 emissions by 1) lengthening the time that soil is protected from the wind with green vegetation; 2) increasing the amount of postharvest residue and standing stubble; and 3) improving soil aggregation. Because of the prostrate and rapid growth habit of winter canola, fall growth is often extensive enough to provide 50–100% soil surface cover-age entering the winter months.

Canola features a relatively low harvest index relative to wheat and produces an abundance of crop residues (Hocking et al. 1997). For every pound of grain, canola produces 3–5 pounds of leaves and stems. Research is needed to verify the details, but many growers have experienced improved soil tilth following canola. Canola residue decomposes more quickly than wheat (Lupwayi et al. 2004), so maintaining crop residue coverage in a succeeding fallow period may prove to be more of a challenge, particularly in tilled fallow. Managing canola residue with direct seed or minimum till-age could help address this issue (Blenis et al. 1999).

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# Wade Troutman Open Heart Ranch, Bridgeport

Figure 28. Wade Troutman started raising winter canola 10 years ago to control feral rye, and has continued to grow it every year since then.

Open Heart Ranch, located in the Foster Creek wa-tershed south of Bridgeport, Washington, is home to Wade Troutman. Wade's family has farmed in the area since homesteading in 1902. With the glacial soils and variable elevation ranging from 1,500 to 2,500 feet, a variety of crops can be grown on his farm. Winter wheat and other grains, canola, peas, fruits, flowers, and vegetables are all part of the sus-tainable operation. Average annual precipitation is 10 inches, which includes snow that covers the fields for more than 100 continuous days in the winter, often lasting through April.

Wade decided to try growing winter canola 10 years ago in his wheat-fallow rotation after observing that his winter wheat was unable to compete with feral rye because of their difference in temperature requirements for germination (Fig. 28). "Rye can germinate at 32°F and under snow, and by summer the winter wheat can't compete with it. We first tried growing spring wheat to control the rye, but with a 5–10 bu/acre yield it was not economically viable either. In our cold climate spring wheat often doesn't germinate until May. When we get 90–100°F temper-atures a month later, those young plants just don't withstand the stress, so winter canola seemed like a good crop to try to get around those issues," Wade explained. After beginning with conventional winter canola varieties, Wade switched to a Roundup Ready variety four years ago, which eventually resulted in the first rye-free wheat field on his farm. He now plants winter canola on nearly 1,000 acres as part of the following four-year rotation: winter wheat-fallow-winter canola-fallow.

## *Agronomics*

Wade uses minimum-till fallow for all of his crop-land, and grows both winter wheat and winter canola on fallow. He conducts spring tillage in May using a 36-foot-wide implement with sweeps on 16-inch centers operated 4 inches deep. He applies fertil-izer in July at 50 pounds of nitrogen (as anhydrous) and 10 pounds of sulfur (as Nitrosul) per acre with a shank machine before wheat and canola harvest are in full swing. In spring 2011, soil test results indicat-ed he should add more nitrogen because of 5 inches greater than normal precipitation during winter and spring. Wade applied 28 lbs/acre of nitrogen in May with a coulter cart into the growing winter canola, with surprisingly little crop damage.

Wade seeds his winter canola in early to mid-August. "I watch the weather and plant canola when the forecast is for moderating temperatures when the seedlings will be trying to emerge," Wade said. He seeds with a John Deere LZB drill on a Flexicoil air seeder cart at 16-inch row spacing at 3 mph to reduce furrow collapse (Fig. 29). Wade calibrates the drill for a 3 lbs/acre seeding rate at about an inch deep. "These glacial soils tend to stay moist longer than other types of soils, so when I place the seed an inch deep it will usually sprout in two or three days," Wade explained.

For weed control, mainly of feral rye, Wade spot sprays Roundup in October where there are heavy patches of rye. He applies Roundup again in the spring at 16 oz/acre where needed as soon as possible after the snow melts. For the last two crop years, the plant growth was so vigorous after seeding canola that the leaf canopy quickly shaded out weeds, so no herbicide was needed in the fall, and only one ap-plication was required in the spring.

Figure 29. Wade has found planting winter canola at a slow speed reduces furrow collapse in the fine-textured, dry soil on his farm.

Fortunately insect pests have not been a problem in the canola, with the exception of thin spots where aphids colonize on late-developing green plants. “Usually within a week of when I see the aphids, predator insects such as ladybugs have controlled the population and I do not need to apply pesticide,” Wade explained.

Wade applies pod sealant to his winter canola to reduce wind shatter, but has found the timing is critical for it to pay off (Fig. 30). When he applied pod sealant in early August, he still lost an estimated 200 lbs/acre to shatter. The next year he adjusted his application to early July with no shattering loss. “It costs $18 per acre, so with this year’s (2011) canola market price of $0.23/lb, I only have to save 78 lbs/acre of yield to cover the cost of the sealant.” Wade also found that pod sealant allows him to better regulate harvest on large acreage. After spraying ripe canola with pod sealant, Wade is able to harvest some fields, then turn to planting canola while the seedbed is still firm and moist, and return again to harvesting without shatter loss.

Figure 30. Wade has learned that proper timing of pod sealant application can make the difference between shattered and intact canola pods in windy conditions.

Figure 31. Wade harvests his winter canola with the reel set high to minimize shatter loss.

## Marketing

Wade purchases his winter canola seed from Central Washington Grain Growers. Over the last three years, he’s tried DKW 13-86 (2009 harvest), DKW 45-10 (2010 harvest), and DKW 46-10 (2011 harvest), all Roundup Ready varieties. Wade split delivery of the canola seed between Odessa (AgVentures NW) and Mansfield (Central Washington Grain Growers) in 2009. “I forward contracted quite a bit at $0.18/lb, and I stored some in hopes of better prices,” he said. “I sold the stored seed to Central Washington Grain Growers for $0.17/lb in 2010, and haven’t decided how and where I will sell my crop this year.”

## Challenges

“Getting a stand of winter canola in August on fal-low is our greatest challenge,” Wade said. Insufficient moisture, furrow collapse, and seed placement can all contribute to frustration with canola. “It’s harder to grow canola than wheat,” Wade commented, “but I am constantly learning and trying better ways to overcome those obstacles.” He would like to see a lot more varieties tested in north-central Washington. “We need canola varieties that are suited to indi-vidual microclimates, like the wheat variety Eltan that was developed for this area for snow mold resis-tance.” Another challenge Wade mentioned is the effect of residual herbicides on canola performance. He said the only way around that is to know the chemi-cal history of each field and plant accordingly. As mentioned previously, Wade has encountered seed loss from his combine header, but can minimize the loss by running the reel high and going slow. Wade has also learned to apply a pod sealant before his winter canola is completely mature to reduce shatter-ing from wind.

## Advantages

"The ground is so mellow following a canola crop; it breaks up the tillage pan. Winter moisture all goes into the canola stubble without any runoff," Wade related. He is also able to get a healthier-looking winter wheat crop with 10–20% higher yield when he includes winter canola in his rotation. Another advantage Wade listed is reduced chemical use. "Now I don't need to spray a summer fallow field that has followed winter canola because the in-crop appli-cation of Roundup takes care of most of the rye." When Wade controls grassy weeds during the canola crop cycle, his wheat yield potential is 60 bu/acre compared to the area average of 50 bu/acre. "Now that I've been growing canola a number of years, I will have three summer fallows and two winter canola crops on a field before I plant wheat, which is resulting in better wheat crops due to both the rye control and improved soil structure."

## Advice to other growers

"From my experience, I would say to know ahead of time that raising winter canola can drive you crazy—you can't see it coming up like winter wheat," Wade shared. "You may have a neighbor drive by and ask what in the world you are trying to accomplish, so you just need to be patient and willing to share information about the whole process (Fig. 32). Defi-nitely seed winter canola not by the calendar, but when soil moisture is sufficient and air temperature is forecast to be less than 90°F for at least 10 days following seeding," he added. Wade advises growers in his area to purchase crop insurance, which was re-cently approved for canola in Douglas County. When it comes to harvesting canola, he cautions growers to be patient because it takes considerably more time than harvesting wheat.

Wade also finds it critical to "know your fields, and know your soils." To learn more about site-specific farming, he bought a GPS for his sprayer tractor. "If I have to stop working in [a large] field because of wind, rain, or something else, [it allows me] to go right back to where I left off."

Another piece of advice Wade offered is to seriously consider growing canola for weed and disease con-trol. "Canola is not more valuable than wheat until you look at the whole picture," he explained. "I was paying $10 an hour to have people pull [rye] plants out of my wheat fields that could get about an acre an hour done, and that sure didn't help my bottom line." Without this added expense, Wade says it is now almost a "given" that he will get a higher profit from his wheat.

Figure 32. Wade Troutman, second from right, sharing informa¬tion about his experience growing winter canola in north-central Washington.

## Winter Canola and Weed Control, A Winning Combination

Frank Young, USDA-ARS researcher, and Dennis Roe, WSU Extension Associate, have worked with Wade Troutman for several years on developing winter canola production strategies (Fig. 33). They have observed the dramatic ben-efits of using Roundup Ready winter canola for feral rye control and subsequent wheat yield and quality improve-ments. Winter wheat–fallow monoculture in one of Wade's fields caused such severe feral rye infestation that Young and Roe estimated the wheat yield would be reduced from 40+ bushels/acre to <20 bushels/acre, and the crop quality due to weed seed contamination would reduce the per acre value. WSU economists Vicki McCracken and Nate Skuza determined that this monoculture wheat rotation would not be profitable, while winter canola grown every fourth year would be highly profitable at 2011 crop prices.

Figure 33. Frank Young, USDA-ARS, visiting with Wade Trout¬man about winter canola on the Open Heart Ranch.

# Summary

All five of the growers featured in Region 2 started their oilseed production experience by growing win-ter canola to expand their crop rotation. Today, three of them still grow winter canola on a regular basis, and spring canola when field and weather conditions allow for timely seeding. Two of the growers have opted to grow mustard instead of canola in recent years, primarily for reduced pest pressure and favor-able contracts, but also for more consistent yields than they were achieving with spring canola. The growers all agree that the extra crop has benefited their farms in many ways, including improved soil conditions and weed control, higher cereal crop yields following the oilseeds, and increased market diversification. Stand establishment and residual herbicides are the two primary constraints to grow-ing oilseed crops in Region 2. These seasoned grow-ers recognize that managing their chemical rotation to avoid plantback restrictions and maximize weed control is critical to successful crop rotation with oilseeds.

The planting method preferred by each grower in Re-gion 2 varies depending on the soil moisture present at seeding. Types of drills include double disk, shank, and split packer deep furrow. While seeding rates are similar among the five farms, row spacing varies from 10 to 28 inches. Regardless of row spacing, growers commented about the compensatory growth habit of canola, which is particularly evident when there are skips in drill rows and the plants have more room to grow. Fertilizer rates based on soil tests are surprisingly similar between the farms despite vary-ing terrain and soil types. Fertilizer timing, however, is quite different on each farm for winter canola: all applied in the spring prior to fall seeding, all ap-plied at planting, or starter levels at planting and the remainder in late fall. All the growers in this region fertilize spring oilseed crops at planting. The majority of them grow Roundup Ready canola varieties, citing the opportunity to control weeds that they can-not during the cereal crop season. In addition, even though Roundup can be applied to winter canola in both fall and spring, the growers have found that rapid canopy development following emergence often negates the need for fall application, thus reducing chemical and labor costs. Their suggestions for oilseed research include the following:

- varieties with increased winterhardiness (later fall planting date options), improved yield and yield consistency, and Group 2 herbicide resistance
- optimum rotational timing of chemicals and oilseed crops
- more herbicides labeled for oilseed crops
- yield trials in more locations

Because of the wide geographical range of Region 2 (Fig. 1), some of the benefits of growing oilseed crops identified by each producer tend to be unique to their microclimate. For example, at the Hutchens farm near the Blue Mountains, growing mustard at higher elevations is advantageous because it is not palatable to deer and elk. Along Highway 2, the fact that canola is not a host plant for wireworms is a significant factor in reducing the pest populations for subsequent wheat crops on the Echelbarger farm. In north-central Washington where snow cover aver-ages 100 days, Wade Troutman observes significantly reduced runoff from snowmelt in the spring when he grows winter canola. Other benefits cited in-clude improved soil structure from root penetration, increased water infiltration, and flexibility in crop choices depending on the market and environmental conditions. Perhaps the most convincing factor why the featured growers continue to raise oilseed crops is the yield increase of subsequent cereal crops in the rotation, particularly winter wheat (as high as 30%). Oilseed yields in Region 2 are 900–3,000 lbs/acre for winter canola, 700–2,550 lbs/acre for spring canola, and 300–1,300 lbs/acre for mustard. Their advice to new and experienced growers is summarized below.

## *Oilseed Production Tips*

- Be prepared and willing to spend more time with an oilseed crop the first time growing one.
- Check the history of each of your fields for herbicide plantback restrictions.
- Develop a crop rotation that includes plans for herbicide rotation to avoid future plantback restric-tions and prevent herbicide resistance.
- Have a plan for oilseed delivery and dedicated storage following harvest, whether on-farm or at a local elevator.
- Consider direct seeding canola into standing crop stubble to protect young seedlings, trap snow for cold insulation during the winter, and improve water infiltration in the spring.
- Select varieties that perform well in your growing region.
- Develop a soil test and field history-based fertilizer management plan that accounts for residual nutrient carryover in your rotation, and minimize fertilizer rates at planting.
- Consider earlier planting dates in order to seed winter canola into moisture to avoid a hot, dry seedbed during emergence and obtain adequately-sized plants to survive cold winter tempera-tures.
- Seed spring oilseed crops as soon as possible after the frost-free date in your area.
- Develop diversified weed management strategies for addressing immediate field-specific weed pressures.

- Use integrated pest management strategies, including scouting fields to determine economic thresholds of insect pests and populations of beneficialinsects before making treatment decisions.
- Be sure your harvesting equipment is ready well ahead of crop maturity.
- Talk with other oilseed producers in your area to find out what they have learned works best for them.
- Survey and compare local oilseed marketing options, including on-farm uses of byproducts such as oilseed meal and biodiesel.


### *Abstract*

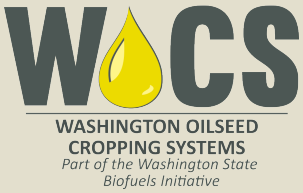
The Washington State Oilseed Cropping Systems Research and Extension Project (WOCS) is funded by the Washington State Legislature to meet expanding biofuel, food, and feed demands with diversified rotations in wheat based cropping systems. The WOCS fact sheet series provides practical oilseed production information based on research findings in eastern Washington. More information can be found at: http://css.wsu.edu/biofuels/.



### *Acknowledgments*

Funding and support for the WOCS provided by:

Washington State Legislature, Washington State Department of Agriculture, Washington Department of Commerce, and the Washington State University Energy Program.

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