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ORGANIC SMALL GRAIN PRODUCTION IN THE INLAND PACIFIC NORTHWEST: A COLLECTION OF CASE STUDIES

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ORGANIC SMALL GRAIN PRODUCTION IN THE INLAND PACIFIC NORTHWEST: A COLLECTION OF CASE STUDIES

By

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Abstract

Organic farming can be a challenge anywhere, but the obstacles encountered by Inland Pacific Northwest organic small grain farmers are unique. Their options for managing weeds and soil nutrients are few, and the limitations of the regional climate don't make things much easier. Nonetheless, organic small grain farmers are out there, and a few are sharing their experience. This publication investigates the farming philosophies and practices of 12 organic small grain producers across Washington, Oregon, and Idaho.

Organic Small Grain Production in the Inland Pacific Northwest: A Collection of Case Studies

Introduction

Organic small grain farmers in the Inland Pacific Northwest face unique challenges. Their options for weed management and soil nutrient management, two common challenges for organic operations, are limited by low precipitation levels, high soil erodibility and few sources of available manure compared to other areas of the country. The region has a “Mediterranean climate” typified by wet winters and dry summers; rainfall events after mid-June are rare. Dryland farmers are limited, therefore, in the diversity of crops (especially warm-season species) that they can include profitably in their rotations.

These case studies were conducted to investigate practices of 12 organic small grain producers in the tri-state region of Washington, Oregon, and Idaho. Annual precipitation in the region was classified as low (less than 12 in.), intermediate (12 to 16 in.), and high (more than 16 in.).

There are representatives from dryland and irrigated production, plus large- and small-scale farms. Some operations were entirely organic while others were mainly conventional with a smaller certified organic acreage. For the farmers who had access to irrigation, some were limited by their water rights so only used it to provide supplementary water. Others used irrigation to boost the economics of their organic fields, but did not irrigate all their ground.

All featured farms included small grains in their cropping system; wheat was the most commonly produced crop, but some farmers also raised barley, triticale, and ancient grains such as emmer and kamut. Small grains were not always the primary cash crop of the farm. In some cases, grain was a rotational crop on farms mostly devoted to hay or vegetable production.

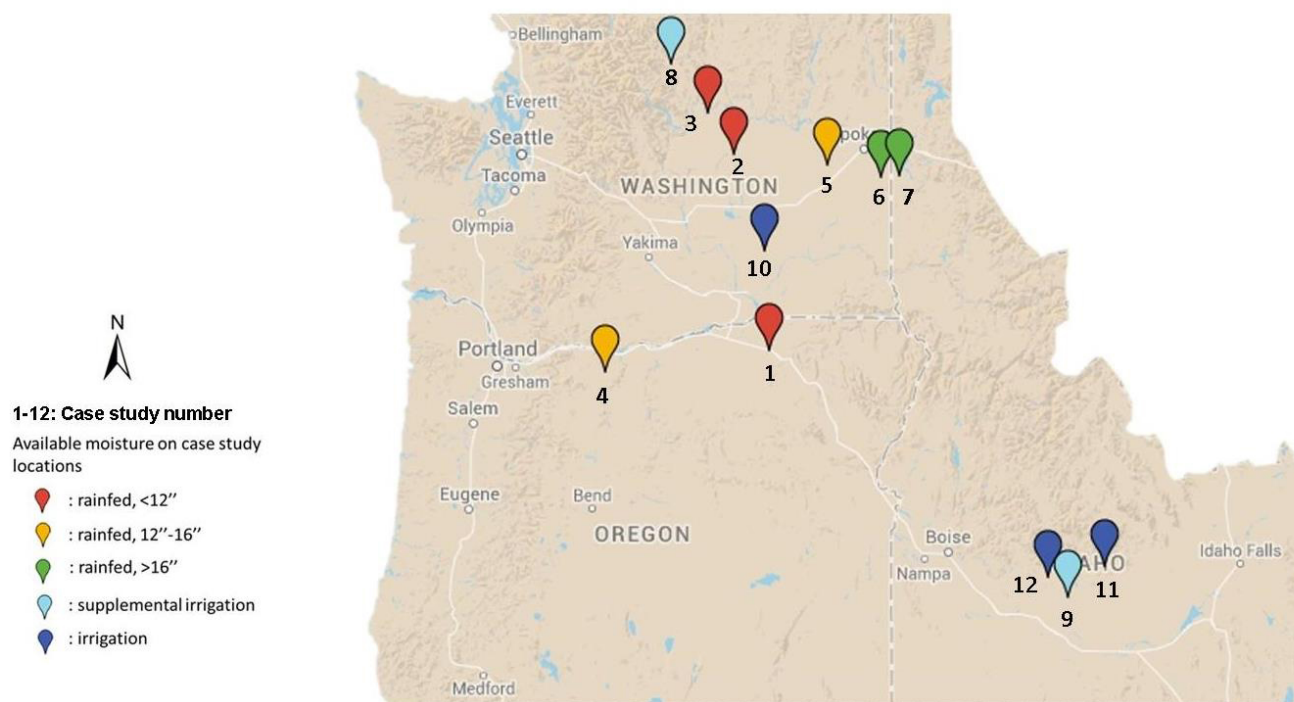


Figure i.1. The 12 producers featured in the case study operate farms with varying available moisture.

The farmers responded to questions on their philosophy of farming, their reasons to try organic production, crop rotation systems, seedbed preparation, soil fertility management, weed and pest management, and marketing. Each grower also offered key pointers to others considering organic grain production. While some elements of the farming system were common to several case studies, all farmers discussed their unique philosophies on organic farming and what had worked well (or not) on their farms.

The featured growers are:

- [Eric Nelson](#), Pendleton, Oregon;
- [Owen and Alan Jorgensen](#), Coulee City, Washington;
- [Wade Troutman and Jane Whiddon](#), Bridgeport, Washington;
- [Nathan Stelzer](#), Dufur, Oregon;
- [Seth Williams](#), Edwall, Washington;
- [David Ostheller](#), Fairfield, Washington;
- [Ted Lacy](#), Worley, Idaho;
- [Sam and Brooke Lucy](#), Winthrop, Washington;
- [Lou and Teresa Anderson](#), Fairfield, Idaho;
- [Brad Bailie](#), Connell, Washington;
- [John Saili and Bryan Wood](#), Carey, Idaho; and
- [William Simon and Matt McLam](#), Fairfield, Idaho.

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The views and opinions expressed in this publication are those of the interviewed growers. They reflect the experiences of the interviewed growers and do not constitute recommendations from Washington State University.

Disclaimer

The goal of this publication is to present a first-hand account of grower experiences with organic production of small grains. Information and testimonies presented are based on growers' experience and not on controlled experiments. They should not be considered university recommendations.

The university recommends that growers test their soil routinely to determine the type and amount of nutrients needed. For soil nutrient management under certified organic farming practices, refer to PNW 646, [Soil Fertility in Organic Systems: A Guide for Gardeners and Small Acreage Farmers](#).

Always check with your organic certification agency before adopting new practices or using new materials.

1. Eric Nelson, Nelson Grade Organics, Pendleton, Oregon

Location: Umatilla County, Oregon

Annual precipitation: 10 to 12 in.

Irrigation: None

Dominant soil type: Walla Walla Silt Loam

Crop rotation: Alfalfa–winter wheat–summer fallow–legume cover crop–spring cereal

In the mid-1990s, Eric Nelson returned to farm the land his family has farmed for four generations. He lives there now with his wife and two daughters. All of his 880 acres near Pendleton, Oregon, are farmed organically (Figure 1.1). His organic adventure started officially in 2005, when Eric began the certification process, but his interest in organic production was spurred much earlier.

“I was in California when the Organic Foods Production Act passed. I admired the goodness and freshness of California produce and to me, good food had to start with good soils. Organic production seemed a way to achieve that,” Eric says.

The soil on Eric’s farm is a silt loam. The low moisture in the region is definitely a challenge for all growers; with less than 12 in. of precipitation a year, the climate is semi-arid. Seventy percent of this moisture comes in the winter months. Cool season grasses are well adapted to these conditions. In general, Eric explains, winter wheat yields twice as much as spring wheat. The topography is relatively flat, with slopes not exceeding 7 percent.

Getting started

A Montana inspiration

Eric farmed conventionally for ten years. During this time, he watched and learned from several organic farmers in Montana: David Oien in Conrad, and Bob Quinn and Jon Tester—both near Big Sandy. They were major inspirations for Eric to implement organic cultural practices, such as cover cropping for weed control and fertility management. However, Eric points out, “Although they also only get 12 in. of moisture in Montana, most of it comes in the summer. This means they can use cover cropping in a way that would not be possible for us here in Oregon.”



Figure 1.1. Eric Nelson stands in a field of organic barley on his farm near Pendleton, Oregon. (Photo by Diana Roberts, WSU Extension.)

Farmers in Montana could afford to establish their cover crop inter-seeded as a companion crop. Eric recalls seeing wheat a foot tall intercropped with clover that was 4 to 6 in. tall. Companion cropping is not possible when most of the moisture comes in the winter months. Eric tried it and says, “I’d be lucky to get only a couple of leaves.”

Most organic farmers in Eric’s area have irrigation and produce high-value crops such as vegetables, which made it difficult for Eric to exchange advice and discuss experience with other local growers. He did get information and encouragement from his local Natural Resources Conservation Service (NRCS) office. Stephen Machado, a soil scientist from Oregon State University, helped him set out test plots on his farm to study different crop rotations.

Transitioning smoothly

The organic certification process takes three years in the U.S. During that time, the land must be farmed with organic production practices, but the crop cannot be sold as certified organic for 36 months after the last application of synthetic pesticide or fertilizer. It can be a tough time as yields may suffer, but growers cannot receive an organic premium for their crop.

Eric minimized risk during the transition period by:

- Starting the conversion to organic on a third of his land at a time; and
- Growing a perennial legume, which minimized equipment needs. (He did not own any haying equipment and had a crop share land lease agreement.)

When Eric started the transition process in 2005, he decided to adopt a stair-step approach. “Every year for three years, I started a third of the acreage in the transition process,” he explains.

With Eric’s stair-step approach, the organic premium price kicked in for a third of his acreage the first year his entire farm was managed organically. During the three-year transition period, the land was planted with alfalfa. Eric used a variety, Ladak, deemed good for its winter hardiness and drought tolerance. He got one cutting per season at 1 ton/acre.

“It is a fairly stemmy variety, but I got enough re-growth after the first cut to graze it, not to swath it though,” he says. He leased the land to sheep ranchers. “Sheep are better than cattle for weed [control], because they will browse for everything,” he explains.

He left the land in alfalfa three to five years. He was exclusively producing organic alfalfa and sheep in 2008 and 2009. “Looking back,” he says, “I would have done more spring crops.”

The transition phase was “tough but do-able,” Eric concludes. He sold his combine when all of the farm was in alfalfa, but still had to pay for someone to cut the hay. Doing a three-step conversion helped financially.

“I budgeted for it and made it work. There is no reason for me now to go back to conventional.”

Crop rotation

Eric arranged his farm to follow an 11-year rotation (Figure 1.2). His 880 acres are divided into 11 fields of approximately 80 acres each. Having each field in a different stage of the rotation allows him to minimize risk, although he admits it creates more border effects and increases the workload.

“The lack of moisture is hard on the alfalfa the first year, when the roots are not big, and it’s not a great competitor when establishing.”

Once the roots grow, alfalfa becomes competitive enough to reduce the weed pressure, in addition to building soil nitrogen. After it establishes the first year, he leaves the alfalfa in for two to three years. It can be challenging to take out; the root system can pull hard on a moldboard plow. Eric plans to try to rip it in the fall with a seven-shank ripper and then undercut it.

Four years of alfalfa provide enough nitrogen in the soil to grow winter wheat the next year. After another cycle of winter wheat–summer fallow, Eric plants a cover crop (chickling vetch, see below) in the ninth year to build up some nitrogen for his spring crops in the last years of the rotation.

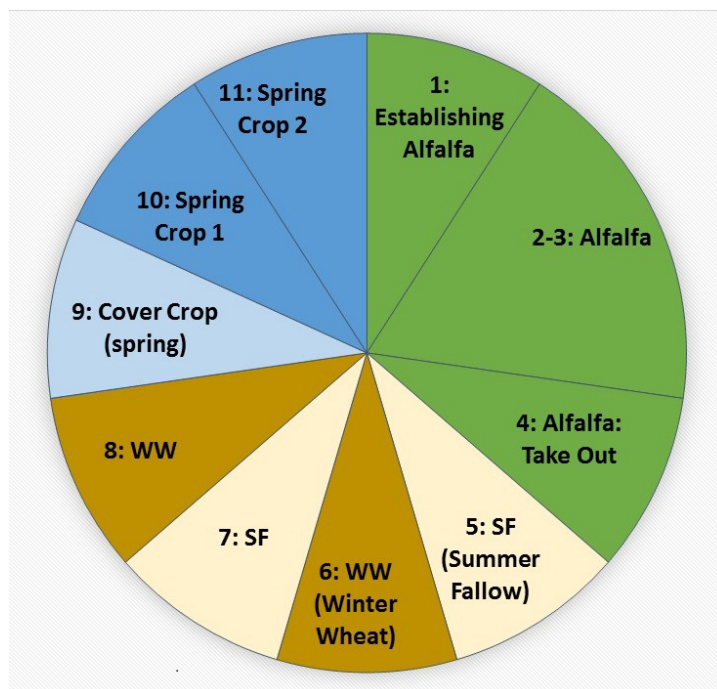


Figure 1.2. Eric Nelson's 11-year rotation.

The 11-year rotation is not set in stone.

“I get different ideas for crop rotations all the time,” Eric says, but he tries to keep it simple. The alfalfa is a must in the rotation.

“Not only does it build the soil nitrogen, but it also breaks up the compaction layer. It’s less work for me, and organic hay prices are good.”

Having a broadleaf in the rotation is a plus, also. He tried camelina, but the market is not consistent enough, and the small size of the seed makes it hard to establish in the dry conditions. He also thought about mustard, but the local buyer already has a grower and demand is limited. He is currently experimenting with quinoa on a few test plots, but “this country [Pendleton] does not really allow for warm-season crops,” he notes.

Winter and spring wheat are the main cereals in his rotation, but Eric also grows feed barley as a spring crop. On a small area, he also grows winter barley. He even tried growing an heirloom grain (emmer wheat) for a niche market. Although his emmer crop looked promising, it ended up not yielding enough for his standards. Eric says he still plans to experiment with it.

“You have to get away from winter wheat when you go into organic,” he says. Weed control in winter wheat is more difficult than for spring crops, and legumes are important for soil fertility.

“It can be a tough adjustment when winter wheat is the bread and butter of conventional farming in the region, but it’s necessary.”

Soil fertility management

Two of the biggest challenges for Eric are moisture and soil fertility—especially nitrogen. Manure would have to be shipped long distances and would be too expensive. Eric tried chicken manure in a pelletized form (N-P-K: 2-4-2 and 4-4-4), but it did not boost yields at a reasonable cost. Instead, Eric prefers to rely on his alfalfa crops to supply nitrogen to two consecutive crops of winter wheat.

He also uses chickling vetch (*Lathyrus sativus*; Figure 1.3), a legume species from Dakota Frontier Seeds marketed as AC Greenfix, to build up soil nitrogen before planting his spring crop. In this low-rainfall environment, small-seeded legumes like clover would be difficult to establish. Chickling vetch seeds are big enough to establish successfully.

“A cover crop [seeded in the spring] uses up moisture,” acknowledges Eric, “but we have two winters to recharge the soil, the one before the cover crop and the winter after, right before we plant our spring crop.” He plants the cover crop no later than April 15th—preferably by March 15th—and then cuts it down at the pre-bloom stage. That gives the cover crop usually 75 days on the ground. He takes it out relatively early to limit water consumption.

Another advantage of the cover crop is that it competes well with weeds. Chickling vetch has a vine growth habit. If it gets too tall, Eric has to mow it down before undercutting it.

Unless the vetch re-establishes, he will wait until the fall to work the ground again.

In terms of bringing nitrogen to the soil, cover cropping does just as well or better than a chicken manure blend, and is much cheaper. Eric has years of data collected on his farm and on the Columbia Basin Agricultural Research Center (CBARC) at Pendleton that encourage him to keep using cover crops for fertilization.

“It would cost me at least \$80 per acre to put down 500 lb per acre of chicken manure, plus all the time to spread it.” A cover crop costs him \$50/acre and provides the same results.

Eric points out how difficult it can be to properly keep track of the finances involved.

“I know how much money goes out for my cover crop, but it’s difficult to account how many dollars’ worth of nitrogen it provides to the spring crop.”

Measuring dry matter production in the cover crop could be used to estimate the amount of nitrogen the cover crop provides. With the moisture limitations Eric has, doing both (growing a cover crop and adding organic fertilizer) would probably not benefit his yields.

“When it comes to winter crops, I could put \$200 per acre worth of [organic] fertilizer on, if I was guaranteed it would bump up the yields.”

But yields are too unpredictable and alfalfa provides great levels of nitrogen, and is profitable, even if marginally so.



Figure 1.3. Chickling vetch (a) in the field, and (b) close-up. (Photos by Diana Roberts, WSU Extension.)

Affordable soil fertility on Eric's farm:

- A cover crop was less costly and provided the same results as applying an organic chicken manure blend.
- Alfalfa builds up soil nitrogen and is a source of revenue.
- Moisture is a limiting factor.
- Higher nitrogen levels will not necessarily result in higher yields.

He performs soil tests on his farm regularly, but not every year. His soils are high in potassium and low in sulfur and phosphorus.

His calcium-to-magnesium ratio is a little bit low, he notes and adds, “In organic production, you look at all sorts of parameters that could affect your soil fertility. Nitrogen, sulfur, and phosphorus levels are important, but it doesn’t stop there.”

Weed and pest management

Soil preparation work in the fall and the spring before planting takes care of most of the weed pressure for spring crops.

“Even if the weed pressure is low in the fall, I still need to work the soil to ensure a clean spring crop.”

Winter wheat has a longer growing season and suffers from higher weed competition. During the summer fallow preceding a winter wheat crop, Eric creates a 3- to 4-in. dust mulch that preserves moisture and prevents weed emergence.



Figure 1.4. Wide row spacing (14 in.) in his winter wheat allows Eric to use in-row tillage for weed management. (Photo by Ian Burke, WSU.)

Because the moisture sits 3 to 4 in. deep, Eric plants his winter wheat in deep furrows to reach that moisture, which requires wider spacing (14 in. instead of 10).

He tried narrower spacing to reduce weed pressure, but it didn’t work, as there wasn’t enough space to get the seed in contact with the moisture. To use narrow row spacing, he had to delay planting until rains could moisten the dust mulch. But this precipitation also triggered weed emergence, and the late-planted wheat was not sufficiently competitive. So Eric went back to wider row spacing (Figure 1.4).

“I had to find a solution for in-crop weed management,” Eric explains, “so I looked at what the row crop growers were doing.”

He adapted an in-row tillage implement system, Acura Trak, to fit his needs (Figure 1.5).



Figure 1.5. Eric Nelson's Acura Trak (a) in-row tillage tool and (b) guidance system. (Photos by Diana Roberts, WSU Extension.)

“It’s basically a three-point hitch with a moving hydraulic arm, and we built a three-point toolbar that matches our drill exactly, so the shanks and shovels would fall right in between the rows.”

Eric has used this system twice so far. He says it can be challenging, timing wise.

“In the fall, when the wheat isn’t very tall yet, the shanks can end up throwing out too much soil on them and bury the crop.” But it’s been a good tool for weed management, he says.

After a grain crop, Eric sometimes needs to mow down the residue. Though there is a market for organic straw, Eric prefers to leave it on the ground to provide a carbon source for his soil. After mowing, he undercuts the rest of the residue and works it again if weeds are coming up. In the spring before a spring crop or summer fallow, he makes another pass with the undercutter, then uses a rod-weeder to take care of the weeds. This creates a dust mulch, mentioned before, that provides weed control and holds moisture 3 to 4 in. below the soil surface.

Sometimes, using a rolling harrow after undercutting is necessary.

“Undercutting can leave a lot of soil clods behind. I’ve found out these clods tend to harbor cheatgrass [downy brome] seeds [See Appendix], so it’s important to break them down to reduce the weed pressure.”

The rolling harrow breaks up the soil clods with the action of leveling bars followed by spiraled blades.

Apart from a few patches of bindweed and Canada thistle, perennial weeds are not much of a problem on Eric’s operation. He says they can be kept in check, not eradicated, by growing alfalfa for several years to outcompete them.

The farm’s weed spectrum changed since Eric transitioned to organic.

“Our cheatgrass [downy brome] problem is almost gone, when it used to be one of our most problematic weeds.”

For pathogen control, Eric says the only option is to choose resistant varieties.

“I picked the wrong variety of winter wheat one year—it got rust, and my yields took a hit. There is no ‘Band-Aid’ solution in organic.”

Eric’s tips on organic weed management

- **Use perennial crops like alfalfa to outcompete perennial weeds.**
- **Plant winter wheat early to give it a head start on weeds.**
- **Draw inspiration from row-crop options for mechanical weed management.**
- **Create a dust mulch during the fallow years. The heat and lack of moisture in the mulch zone prevent weed seed germination and moisture is kept at the wheat-planting depth.**

Marketing and certification

Eric encountered unexpected changes when he started the certification process. A seemingly small, but important difference is the way material is handled in organic farming.

“You have to get used to not dealing in bulk anymore.”

For example, instead of getting his seed in bulk at the local co-op, it now arrives in 50-lb bags stacked on a pallet.

“It’s crazy how much more we use the forklift since we’ve been in organic,” he says with a smile. “Fertilizer, seeds...everything shows up in tote bags. It can be a challenge sometimes when you are by yourself and the forklift won’t go high enough.”

Requirements can be a constraint.

“The local co-op used to be certified to clean seed organically and I could just use my own seed and have it cleaned there. [They] can’t do that anymore.”

Per organic certification requirements, he can use non-treated conventional seed, but under one condition: He must first look for the certified organic seed of the same variety with “due diligence.”

“Due diligence means that if I can find organic seed for the variety I want, but it is 5,000 miles away, I still have to go with that instead of buying non-treated conventional seed!”

Fortunately, due diligence still allows growers to look for a specific variety.

“Most certified organic varieties available are not really adapted to our environment, but regulations allow me to use the varieties I want if they are not available as certified organic.”

Marketing advice from Eric: Build professional relationships with your buyers.

The paperwork can be challenging, too.

“You do need to keep very accurate records and document that you did comply with due diligence for every step of the way.”

There is a yearly inspection that takes up an entire day. In addition, Eric estimates he spends 10 to 20 hours a month to complete the required record keeping.

But there is a positive side to these constraints, Eric points out.

“It’s all something I am willing to do. I actually like that. It creates a niche that I am willing to fill.”

And filling a niche in the consumers’ demands pays.

“I am not a price taker. I can afford to negotiate with my buyers,” he says.

Things are different in the much bigger feed market, he admits. But he built up solid relationships with his buyers.

“It really goes both ways,” he says.

He found his first buyer, Bob’s Red Mill, by making a lot of phone calls. Subsequently, word got out and he now gets unexpected phone calls. He sells only after harvest, because the price depends a lot on grain quality. Most of the buyers sell to domestic consumers in the region, and his proximity to Portland helps.

With this niche activity, “I can stay small, which is what I want for now.” The price premium offered for certified organic crops usually makes up for any yield decrease.

“And that’s true even when the conventional prices are good,” Eric says.

Benefits and challenges

When asked his main reason to stay in organic, Eric exclaims, “I love the challenge!” He finds it exciting to come up with new solutions. Now that he realized dryland organic farming was possible, he has no desire to go back to conventional.

He mentions soil nutrient levels, especially nitrogen, as his biggest challenge. Although he has had success with his cover crop, he says, “I need to think about other sources of [nutrient] input.”

He cites the main benefit of organic production as being more in touch with his land.

“I need to walk my fields often. There is a narrow window for any operation in organic farming, so you really need to know where your crop is at, at any moment. I still have consultants coming in, but I do most of the scouting myself.”

He has not noticed significant differences in soil yet. Because all the moisture comes in the winter months, change is likely to be slow. He does note that his soil is a little more friable than it used to be. Interestingly, his neighbor who uses similar methods for his no-till operation (crop rotation including broadleaves, cover crops, etc.) also says his soil seems looser.

“I think I also might have improved the water capacity by adding carbon in the form of straw,” he adds.

Advice to other growers

If he had one piece of advice to offer to growers considering dryland organic small-grain production, Eric says it would be to “start small, but be committed.”

He stresses that transitioning to organic requires a change of mindset: “You can’t rely on winter wheat any more. It might be better to do a cover crop–spring crop system to start with.”

Also, he recommends keeping “a sense of humor and don’t be too hard on yourself.”

Transition years can be tough, but once the certification phase starts, the price premium counters lower yields.

He concludes, “It’s a tough balance between being stubborn enough to keep going, but being flexible enough to seek new practices and solutions to new problems.”

What does the law say?

Improving soil quality

Organic producers have to maintain soil health. Section (a) of § 205.203 states that organic growers must “maintain or improve the physical, chemical, and biological condition of the soil and minimize erosion.”

Regular soil testing can help monitor the effects of farming practices on the soil. Increasing organic matter builds soil health by increasing water-holding capacity and nutrient availability. The use of green manures, animal manures, companion crops, and conservation tillage is encouraged to preserve and build soil structure and limit erosion.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

2. Owen and Alan Jorgensen, Sunrich Farms, Coulee City, Washington

Location: Douglas County, Washington

Annual precipitation: 10 to 12 in.

Irrigation: None

Dominant soil type: Touhey-Stubblefield complex

Crop rotation: Winter wheat–summer fallow; now winter triticale–spring triticale–summer fallow

Owen Jorgensen farms with his brother, Alan, and his son, Shiloh, on more than 4,000 acres in Douglas County, Washington. His farm encompasses a wide range of soils, with a pH near 7, with clay loams and sandy loams, plus a few alkali flats. With 10 to 12 in. of precipitation in a year, mostly in the winter, he operates on a summer fallow–winter wheat rotation.

He and his three brothers got interested in organic production 25 years ago. They started with 160 acres on a summer fallow–winter wheat (Figure 2.1) rotation and expanded progressively to 800 acres. Recently, they scaled back their organic operation to 160 acres on a three-year rotation of winter triticale, spring triticale, and summer fallow. (See [sidebar](#) in Brad Bailie’s case study for more information about triticale.)

Getting started

“At first, my brothers were the ones most interested in organic,” Owen recalls. “I was fine with giving it a try, since it’s such a big farm.”

His brother Alan remembers being sickened by the smell of barrels of dicamba and 2,4-D, and wanting to try something different. When they started, there was little information available. Owen read a few books from Acres USA and Mother Earth News.

“They were not directed at our type of operation, they were more gardening books about how the soil works,” explains Owen. But he found it valuable to learn more about soils.



Figure 2.1. Owen Jorgensen inspects a new seeding of organic winter wheat. (Photo by Diana Roberts, WSU Extension.)

They began by devoting ground to organic production that was either coming out of Conservation Reserve Program (CRP) contracts or had not been farmed before, so transitioning from conventional was not an issue. They kept their rotation in a summer fallow–winter wheat system.

“Soft white was our main crop, and our growing conditions made it very appreciated by buyers,” says Owen.

Crop rotation

One reason for Owen to reduce his organic acreage back to 160 acres (down from 800 acres) was an increasing infestation of jointed goatgrass on his farm.

“It started ten to 12 years ago in small patches, and eventually reached a point where I would find more goatgrass than wheat in the field,” recalls Owen. “It’s a weed that can’t be ignored,” he insists.

A winter annual, jointed goatgrass follows the cycle of winter wheat, which makes it very challenging to control through cultural or mechanical practices. Another pernicious feature of jointed goatgrass is its growth habit.

“Some plants stand up tall while others bend down low, so you can’t set your combine header to avoid harvesting it like you can with cheatgrass,” Owen explains.

Low rainfall and dry summers excluded rotating to spring wheat. Other rotational crops like peas, flax, or lentils were not an option either.



Figure 2.2. Rocks in the field are a constant problem for farmers in Douglas County, Washington. (Photo by Diana Roberts, WSU Extension.)

“The rocks in the field prevent me lowering the combine header enough to harvest these crops,” Owen says (Figure 2.2).

Another limiting factor Owen has to work with is erosion.

“I tried to do a double summer fallow, but the wind blew too much soil. A double summer fallow just doesn’t work in a windy country.”

His brother Alan adds, “A double summer fallow works great for weed management and crop health, but not financially.”

Owen stopped growing organic wheat and turned to triticale, a hybrid between wheat and rye. He first tried a three-year rotation of winter triticale–summer fallow with winter peas as a cover crop.

“Peas worked in the sense that they put some nitrogen in the soil, but they did not leave a good enough residue [to protect the soil] for the summer fallow,” relates Owen.

But the triticale, a competitive crop, was successful in reducing goatgrass populations. In 2014, Owen tried a rotation of winter triticale–spring triticale–summer fallow.

Eltan has been the standard winter wheat variety for both his organic and conventional operation. With a good tolerance to disease (in particular snow mold), Eltan has worked well in the organic operation. Because they cannot source organic Eltan seed stock, the Jorgensens have had to use conventionally sourced Eltan seed with no seed treatment. With triticale, Owen sourced TriMark from his local co-op.

Soil fertility management

One of their first steps was to look into different types of fertilizers.

“That’s one of the hard parts in organic, getting nitrogen,” acknowledges Owen.

Growing a cover crop was not practical considering the amount of moisture they receive in an average year, so they had to turn to external sources of nutrients.

“Blood meal worked best, and had really high nitrogen contents,” recalls Owen. But the smell made blood meal a difficult product to work with.

Because the cost of broadcasting the fertilizer was prohibitive, Owen devised a system to band the blood meal with the seed. At first, he mixed the seed with the blood meal (which came in a powder form). Later, he rigged an aircart behind his drill to blow the fertilizer back in the row with the seed. The last few years, he hooked up three of his 8300 Series John Deere drills, one behind the other (Figure 2.3).

“I put the fertilizer in one and the seed in the other. It takes a while, because these drills are only 13 ft wide, but everything takes longer in organic,” explains Owen.



Figure 2.3. Running his 8300 Series John Deere drills in tandem enables Owen Jorgensen to put down seed and fertilizer in one pass. (Photo by Diana Roberts, WSU Extension.)

He now uses pelletized chicken manure (Perfect Blend, a 4-4-4 proprietary fertilizer). Scaling back his organic acreage allowed him to provide an adequate supply of organic fertilizer, which is scarce.

Weed and pest management

Owen hopes his three-year rotation will help reduce the jointed goatgrass pressure in his organic acreage, but he also uses other tools for weed management. His summer fallow tillage program is similar to what he does in his conventional ground, excluding a spring glyphosate application. He cultivates, then rod-weeds as needed the summer prior to seeding, which produces a fine dust mulch that preserves moisture and prevents weed germination.

Owen uses a variety of practices to manage weeds on his organic acreage:

- **Dust-mulching using a rod-weeder;**
- **Post-emergence tillage, with a rotary harrow;**
- **Heavy seeding rates compensate for crop damage from post-emergence tillage, also increase crop competitiveness; and**
- **Placing the fertilizer in the row to favor the crop over the weeds.**

In winter wheat or winter triticale, he uses a rotary harrow to manage emerging spring weeds within the crop.

“The crop is big and established and the weeds are still small. I can control about 80 percent of mustards and other broadleaves with harrowing,” Owen explains.

He drives the implement parallel to the rows, which can seem harsh on the crop at first sight. But the seeded winter wheat or triticale does not incur any damage from the operation.

For effective weed control with the rotary harrow, timing is critical.

“The soil has to be dry enough to get in the field, but moist enough that the harrow won’t just scratch the surface,” Owen says.

Several trips over the field with the rotary harrow are often necessary to achieve satisfactory weed control. To compensate for possible crop damage due to harrowing, Owen seeds his organic acreage heavier than his conventional ground, 50 lb/acre instead of 35 to 40 lb/acre. He uses the same row spacing, 14 in., for both organic and conventional.

Field bindweed also has been a challenging weed to manage.

“At first, I thought that since it needed sunlight to grow I could try to [rod-weed] it once a week, all summer long...well, it turns out bindweed can still grow without sunlight!” relates Owen.

The only efficient control method he found for this perennial weed was to mark out the bindweed-infested spot, take it out of certified organic production, and treat it with a systemic herbicide, even if it meant having to re-transition that spot later.

Alan adds that he observes some weeds as indicators of soil problems. “Russian thistle can indicate low phosphorus, for example,” he says.

“Overall, we’ve found that the key to dryland organic small grains was to put the fertilizer in the row and to harrow [out weeds] in the spring for winter-seeded crops,” concludes Owen.

Marketing and certification

After one year of heavy lambsquarters contamination in his organic wheat, Owen decided to invest in a good air-screen machine seed cleaner. They have used it ever since on all of their organic production. “My organic crop is not very big, so we can run it through our own cleaning mill,” Owen explains. He does not need to use it every year.

Owen does not devote storage facilities exclusively to his organic production, so he washes his grain bins before storing his organic crop, “unless it had organic grain in the year before.”

“We had a buyer lined up right when we started. There were not a lot of people farming organically in the eighties,” recalls Owen. He used to sell his organic wheat to Fairhaven Mills in Seattle and another buyer. One of their buyers believed Jorgensen’s soft white wheat had better milling qualities because it was produced on dryland and not irrigated.

“Profit-wise, producing organic wheat is equivalent to producing conventionally. There is a premium for organic, but the yields are not as good,” explains Owen. “One year, organic wheat went to \$20 a bushel—if you could do that every year, [organic] farming would be very profitable!”

Owen estimates he typically gets a price for organic wheat that is 30 percent higher than for conventional. He says his inputs are equivalent, in cost, for both modes of production, and yields are lower in organic.

Currently, his entire triticale crop is sold for organic chicken feed to a buyer on the West Coast.

“Selling the crop can take time, as opposed to just bringing it to the local co-op,” acknowledges Owen.

Owen recalls that the certification process was a “difficult and tiresome” experience, but he notes that several recent changes in regulations have made it smoother.

“Nowadays you can just check a mark if you did not make any changes compared with the previous year,” he explains. His last inspection only lasted an hour and a half, but “it used to be much longer.”

In Owen's experience, the premium for certified organic production compensates for the lower yields. This makes his organic and conventional systems equivalent in profitability.

Benefits and challenges

Owen says that there is more “fiddling around” involved when growing organic crops (Figure 2.4), but some of his adaptations to the constraints of organic production standards have found their way into his conventional production. For instance, they found that increasing the seeding rate for winter wheat to 50 lb/acre in conventional was advantageous; the heavier wheat stand pushes through the soil crust better.

They also have used the rotary harrow for their conventional production. When an early rain seals the ground before winter wheat has had a chance to emerge, their experience with harrowing in organic enables them to use this tool in the conventional ground. Harrowing after an early rain prevents them from having to reseed.

Alan believes the soil practices in organic farming foster crop health. He remembers, “We forgot to put a seed treatment on the conventional seed one year, and we had smut that year. The smut was much worse in conventional than in organic.”

He says that when using a refractor on his wheat, he always found higher sugar content in his organic fields.



Figure 2.4. Owen has experimented with many organic soil fertility systems, including inter-seeding winter peas with winter wheat. (Photo by Diana Roberts, WSU Extension.)

“Our neighbor’s cows got out of their pasture one year in late May and walked half a mile past a conventional field to go graze our organic fields. They must have smelled the higher mineral content,” relates Alan.

Alan adds that the organic matter has been building up in their organic fields. It is now around 1.9 percent, up from 1 to 1.5 percent when they started farming organically.

Owen believes the main benefit of his organic operation is the learning experience it provides.

“Soil is very complicated and we don’t understand what is going on in the reality of the fields. If I can apply things I have learned from organic to my conventional operation, I improve my bottom line by improving my soil even if I don’t get the organic premium.”

Owen has found some techniques that he uses on his certified organic ground, like an increased seeding rate, can also be put to good use on his conventional acreage.

Future plans and advice to other growers

Alan does not see any reason to quit farming organically, considering they have a buyer and “it’s fun doing things that nobody else is doing.”

Owen admits the time and energy he has to devote to his organic fields made him consider getting out of it. But the triticale (Figure 2.5) cut down the work, as it is sold for chicken feed.

“We developed a system that is workable and financially sustainable. It’s up to the new generations to keep it up,” says Owen.

Their advice to growers interested in organic production is to “start small, even if that’s relative,” says Owen. And “stick with it,” adds Alan. “Getting in to it just to see if it works is a bad idea,” Alan cautions.

Owen plans to try to widen his rows even more and go to 18-in. spacing to increase available moisture for his spring crop. He does not exclude re-expanding his organic acreage if the buyer keeps up the demand and if jointed goatgrass does not return.



Figure 2.5 Owen Jorgensen in a field of organic winter triticale, which he sells for chicken feed. (Photo by Diana Roberts, WSU Extension.)

He concludes, “Most farmers think of themselves as stewards of the land. Nobody wants to rob the soil. It has to last through generations. We need to figure out what leaves the soil in good condition. If we can do it in our lifetime, then it’s a win-win.”

What does the law say?

Transitioning from CRP

Most land under a Conservation Reserve Program (CRP) contract can be relatively easy to transition to organic. If no prohibited substances have been applied in the three years prior to the end of the contract, the land may be certified immediately when brought back into agricultural production.

While it is tempting for farmers to use this option, it is important to balance the pros and cons of the situation. Without any herbicide application after the end of the CRP contract, the ground may be infested with weeds, which is not advantageous for entering organic production. Also, intense tillage likely will be needed to kill the perennial grass and control weeds. As land entered into CRP is classified as highly erodible, heavy tillage may well cause erosion and loss of the soil health benefits accumulated under CRP.

These factors make entering CRP land into organic production questionable with regard to responsible use of federal funds and public perception of the organic movement. We recommend that farmers consider all factors carefully before making the decision to proceed.

Find the complete National Organic Program regulations [here](#).

The Guide for Organic Crop Producers is [here](#).

3. Wade Troutman and Jane Whiddon, Open Heart Ranch, Bridgeport, Washington

Location: Douglas County, Washington

Annual precipitation: 10 to 12 in.

Irrigation: None

Dominant soil type: Cashmere fine sandy loam

Crop rotation: Summer fallow–winter canola–Dark Northern spring wheat

Wade Troutman is a fourth-generation farmer near Bridgeport in Douglas County, Washington. The 300 acres he farms organically are on the ground that his great-grandfather established as a homestead in 1902. With 10 in. of annual precipitation, Wade farms most of his ground on a summer fallow–winter wheat–summer fallow–winter canola rotation. He grows hard red spring wheat that grades Dark Northern (DNS) as his main organic crop (Figure 3.1). His wife, Jane Whiddon, also grows certified organic fruits and vegetables in a two-acre garden.

Getting started

Different backgrounds

Wade has extensive experience in growing wheat.

“My father was a cow/calf guy, with a little bit of alfalfa. When I came back with my agricultural degree from [Washington State University (WSU)], I wanted to implement some of what I had learned.”

His father let him start on 600 acres of summer fallow–winter wheat, and over the years Wade built up his acreage to 5,200 acres. His soil is a glacial complex tending toward a sandy loam, with a pH close to 7.

“There is bedrock a couple of feet down, which limits the water-holding capacity of the soil,” says Wade, although they rarely get enough moisture to reach that limit.

With a rolling topography varying from 1,500 to 2,100 feet in elevation, Wade works with a shorter growing season than growers in the valley at the same latitude.



Figure 3.1. Wade Troutman examines organic spring wheat grown near Bridgeport, Washington. (Photo by Diana Roberts, WSU Extension.)

“I cannot get in my fields before April, and I won’t plant spring wheat before the 1st of May,” he says. The higher elevation and location of his farms provide cooler temperatures and slower transpiration rates, which allow him to grow winter canola under very low annual precipitation.

Wade and Jane came to organic farming from very different perspectives. Jane, who lived in Atlanta for a number of years, had limited access to fresh food and was accustomed to paying a premium for higher-quality products, which were sometimes labeled organic. Wade, a seasoned wheat grower, tried organic as an alternative economic production model. He started the certification process in 2000.

“During my years as a student at WSU, I was pushed to produce more for less, to be as efficient as possible, to bank on economies of scale, and to grow wheat cheaper than everyone else. Well, it did not always work. Any time wheat prices would go up, it seemed all my costs would, too.”

Transitioning to organic

He first tried organic production by transitioning 40 acres on the land his great-grandfather homesteaded.

“I tried four crops, mostly different classes of wheat, because that’s what I have the most experience with,” he says. He grew 10 acres each of hard red winter, soft red winter, hard red spring (that graded DNS), and peas.

By transitioning to organic farming with a winter wheat–summer fallow system, Wade had to sell a crop grown under organic practices in the conventional market only once before being certified organic.

Transitioning from a conventional dryland winter wheat–summer fallow system to organic was “fairly easy” (Figure 3.2). Wade put down anhydrous ammonia in May of year one before going into summer fallow. The following fall, he planted a crop of winter wheat and grew the crop without applying any seed treatment or herbicides.

“It yielded fairly well,” recalls Wade, and he sold it on the conventional market with minimal revenue losses compared to his conventional wheat. He followed winter wheat with summer fallow. The following year, he planted spring wheat in May. By the time the wheat was ripe for harvest, it had been three years since any synthetic fertilizers or pesticides were applied to the field; Wade could market it as certified organic.

“Transitioning from a [wheat–fallow] dryland system is not as painful as [it is] for someone who raises annual crops,” concludes Wade. “You are not hit as hard by dragging yields. It’s a huge advantage of the traditional summer fallow–winter wheat rotation.”

Crop rotation

Once certified organic, Wade changed his rotation. He tried to incorporate legumes to supply fertility to his wheat crop, “because I knew the (lack of) nitrogen was going to kill me,” he says.

Finding a market for these crops proved difficult. He sold his peas to local goat dairy farms and his winter wheat to a hog operation located near Mount Vernon, but took a different approach to sell his DNS wheat.

“I hiked around Seattle, from bakery to bakery. I eventually stopped at Great Harvest Bakery, where the owner milled his own grain. Well, they wanted some Washington-grown grain, but had a hard time finding any.”

After agreeing on a price, Wade sold all of his spring wheat to the Seattle bakery.

“The first year, we delivered everything in 50-lb bags,” he recalls.

It was the start of a fruitful business relationship. Wade transitioned the rest of the half-section of the old homestead to expand his DNS acreage.

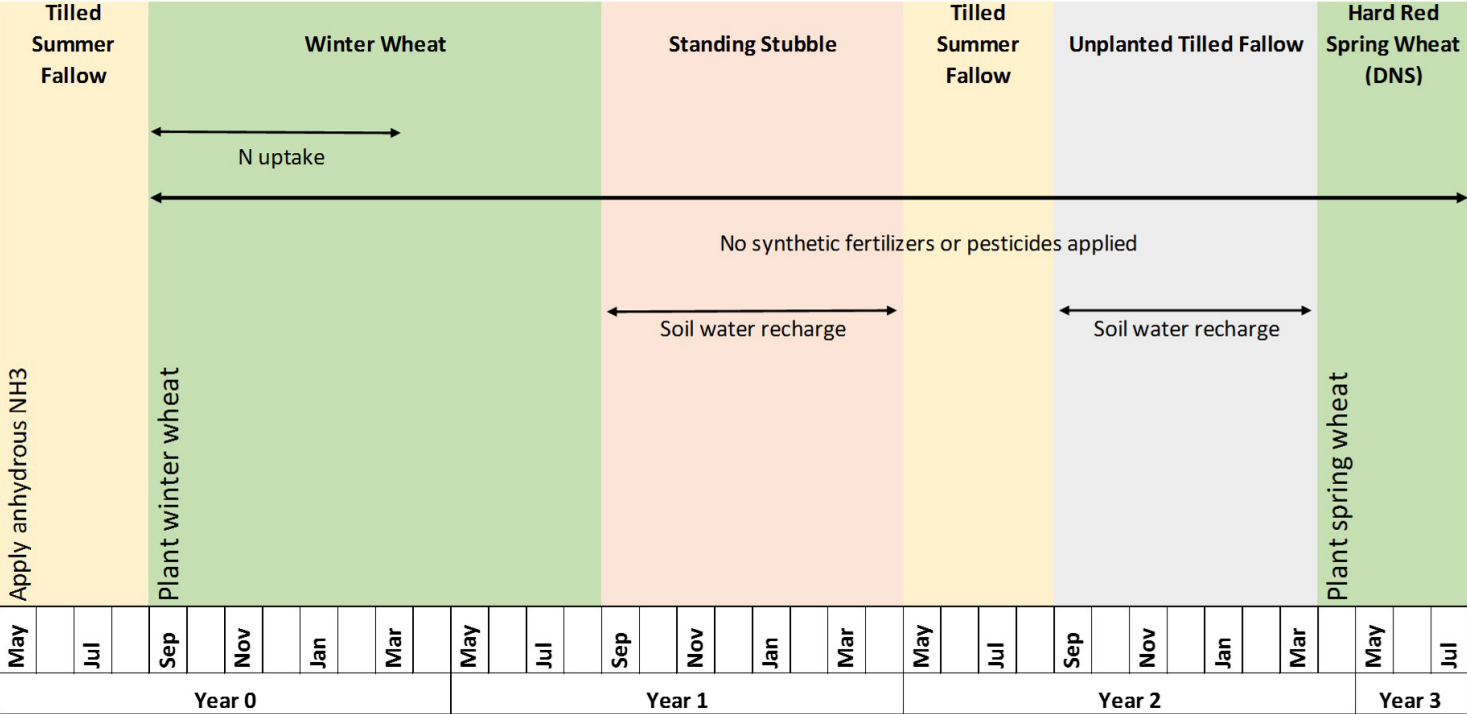


Figure 3.2. Operating in a winter wheat–summer fallow rotation during the transition period allowed Wade to go through only one growing season in the 36 months of the transition.

He first used a summer fallow–yellow split pea– spring wheat rotation.

“Yellow split is a winter pea. I would plant it in the fall after the summer fallow. It did great in the fall but it would just sit there in the spring, while weeds were taking off,” relates Wade.

Due to the lack of competitiveness in peas and difficulty in marketing them, Wade looked for another rotational crop. He decided to try winter canola for its competitiveness in the spring. He found Largo, a non-genetically modified organism (GMO) certified variety.

“It did fine and the yield was comfortable,” says Wade, but his pea production from the previous year (2013) is still in storage because he could not find a buyer. Steering away from peas and turning to canola as a rotational crop meant Wade had to find another way to supply nitrogen to his crops.

Soil fertility management

Wade now buys fertilizer derived from chicken manure.

“Adding nitrogen that way costs me \$60 per acre, as opposed to \$40 per acre for what I do in conventional,” says Wade. He has used a spreadable chicken compost from Western Horizon. In 2013, he used a 4-4-4 pelletized chicken fertilizer from Perfect Blend.

Wade tries to apply around 60 lb of nitrogen per acre, which he estimates requires a ton of spreadable compost per acre. In comparison, a ton of pelletized Perfect Blend contains 80 lb of nitrogen.

“The pelletized fertilizer [from Perfect Blend] was more expensive per pound of nitrogen, so I banded it with the seed,” Wade explains. That proved challenging—he had to open the air to the maximum setting on his Flexicoil drill to blow out the heavy pellets, and still could only apply 20 to 25 lb of nitrogen per acre.

“It didn’t plug the drill, but I had to open the air to the maximum and [the drill] was struggling,” says Wade.

While fertility management remains a challenge, Wade notes that he has seen his soil organic matter content almost double since he transitioned to organic.

“I went from 0.7 percent before transitioning to 1.3 percent now,” he says.

Weed and pest management

Weed management is mostly accomplished through tillage prior to planting. In conventional fields, Wade applies a spring herbicide treatment and cultivates the soil three times before planting. He forgoes the herbicide application in organic and makes two extra cultivation trips instead. Wade does not use any in-crop tillage. Annual weeds, especially grasses like goatgrass, cheatgrass (downy brome), and feral rye, are taken care of through tillage prior to planting spring wheat, or, if they emerge late, are outcompeted by spring wheat.

Yellow peas were unsuccessful in competing with Russian thistle and mustard species. Winter canola’s aggressive growth took care of most weed problems for Wade, but has the disadvantage of not supplying any nitrogen to the following crop.

The two extra tillage operations for weed control might affect the available water in his crop, but Wade has not seen that happen. Well versed in conservation initiatives, Wade points out that he bumped up his organic matter by 0.2 points on his conventional land over all the years he has been farming, while the organic matter on his organic ground increased by 0.7 points in just a few years.

“I think that compensates for the extra tillage operations,” Wade says.

More organic matter improves the soil structure and increases water-holding capacity. Adding canola in the rotation also helped by opening up the soil with taproots.

Canola in Wade’s rotation:

- **Competes well against weeds; and**
- **Increases the soil’s water-holding capacity thanks to its taproots.**

Marketing and certification

Marketing, especially for rotational crops, has proven to be Wade’s biggest challenge in his organic operation. In the beginning, Wade sold his pea crop to goat dairies.

“When I expanded to 100 acres of peas [from 10 acres], I went to several buyers. Eventually, a distributor told me they could find organic yellow split peas from China for \$300 a ton. The conventional price was \$320 a ton!” relates Wade.

For canola, marketing was not any easier. Wade was not able to find a buyer willing to contract for it. He found a certified crusher in Yakima who could sell the meal, but could not find a buyer for the oil.

“I could sell it as a non-GMO, but that’s not the premium offered for organic,” explains Wade, who is holding his production until he finds a buyer.

The bakery in Seattle closed last year, which forced Wade to find another buyer for his spring wheat. He sends it to Hummingbird Wholesale in Eugene, Oregon.

“It probably costs me \$1.50 a bushel to ship it there, but I clean it myself, so I don’t get charged more for processing, handling, and shipping in organic than I do for the conventional wheat I send to the elevator,” Wade explains.

Another pricing challenge in organic is dealing with crop insurance. At the time Wade raised yellow split peas, crop insurance programs still paid for crop disaster using conventional crop prices and yield potentials.

“The peas were a bust, economically,” Wade concludes. Selling peas or canola at conventional prices hurts the profitability of his organic production.

Because of the difficulties in finding buyers for organic peas or canola, Wade needs to store his organically produced crop on the farm. He keeps his conventional crop at the elevator, where it can move fast when prices are volatile. He keeps a two-ton truck dedicated to the transport of organic crops.

His experience with the certification process has been positive.

“The people at WSDA [Washington State Department of Agriculture] have been helpful,” he says, adding that the inspector has been providing the information he needs.

“Going through certification helped educate myself.”

Wade admits the bookkeeping can be redundant, since he needs to keep track of his conventional and his organic operations separately. He estimates it takes him two days a year to renew the certification, plus one day to go through inspection.

“It’s probably quicker than for a CSP [Conservation Stewardship Program] contract with NRCS [Natural Resources Conservation Service],” he adds.

Benefits and challenges

“Organic [farming] is more labor intensive than conventional, but out-of-pocket expenses are also smaller in organic,” Wade comments.

There are no seed treatments or technology, herbicide applications, or synthetic fertilizers to pay for. Wade thinks that is one advantage of organic.

“If you are a new or young farmer trying to get started, you might not have the capital, but you have the energy to supply the labor.” With a higher return rate per acre for organic, the high labor/low input approach can make an operation work on a smaller scale (Figure 3.3).

With 1,000 acres in conventional production (the rest of his farm is under CRP contracts), Wade notes that it becomes difficult to justify purchasing new equipment to match his small production scale. New machinery is increasingly tailored to bigger operations and comes with a high price tag. Organic production requires intensive labor. However, Wade believes it can be a good way to add value to a crop on land otherwise marginal for agricultural production.

Because labor is more of a driving force in organic production, “organic takes marginalization out when land cannot adapt to new technologies,” Wade concludes.

For instance, a small field that is difficult to access might not be profitable to cultivate under conventional practices because it does not lend itself well to economies of scale. The same field cultivated under labor-intensive, low-input organic practices, would yield a crop sold at a premium that would make the land profitable.



Figure 3.3. Wade Troutman advises new farmers to find a good mentor with farming experience. (Photo by Diana Roberts, WSU Extension.)

Finding a buyer for certified organic grain can be a challenge.

Wade adds, “It is the quickest way in today’s world for someone tight on cash flow to get started if they can substitute the labor for it.”

Wade credits his success in organic production to his experience with conventional wheat. Because of the dry conditions he farms under, he never uses fungicides or insecticides on his conventional wheat (although he does on canola).

“With a good IPM [Integrated Pest Management] program there is no need to use 2,4-D, except on the borders sometimes. I know you can bump up protein by planting so that the wheat is flowering when it’s hot, or that wireworms will go back in the ground if the temperatures are right,” he explains.

“Organic can be a hard sale in rural areas,” admits Wade. He sees opposition between generational farmers, who can perceive organic as a threat to their production practices and “new age” farmers, who often come from an urban background.

“They could learn a lot from each other,” notes Wade, who says that despite opposing ideologies, both groups share the same love of the land. “Generational farmers have all the agricultural experience, they really know their dirt, while the new farmers know how to sell, how to market.”

Future plans and advice to other growers

Wade’s advice for someone interested in going into organic is to “figure out who will be your end user. If you are new to farming, learn from someone with farming experience (Figure 3.3). If you have farmed for a while, get better at marketing, because the market for organic is not as well developed as conventional.”

Wade’s primary motivation to stay in organic is the improvement of soil health, which is a goal he has pursued all his farming life. He is concerned that perennial weeds such as Canada thistle and field bindweed jeopardize his soil conservation achievements in his organic ground.

Because tools for perennial weed management are limited in organic production, he considers implementing an original rotation for his organic land (Figure 3.4).

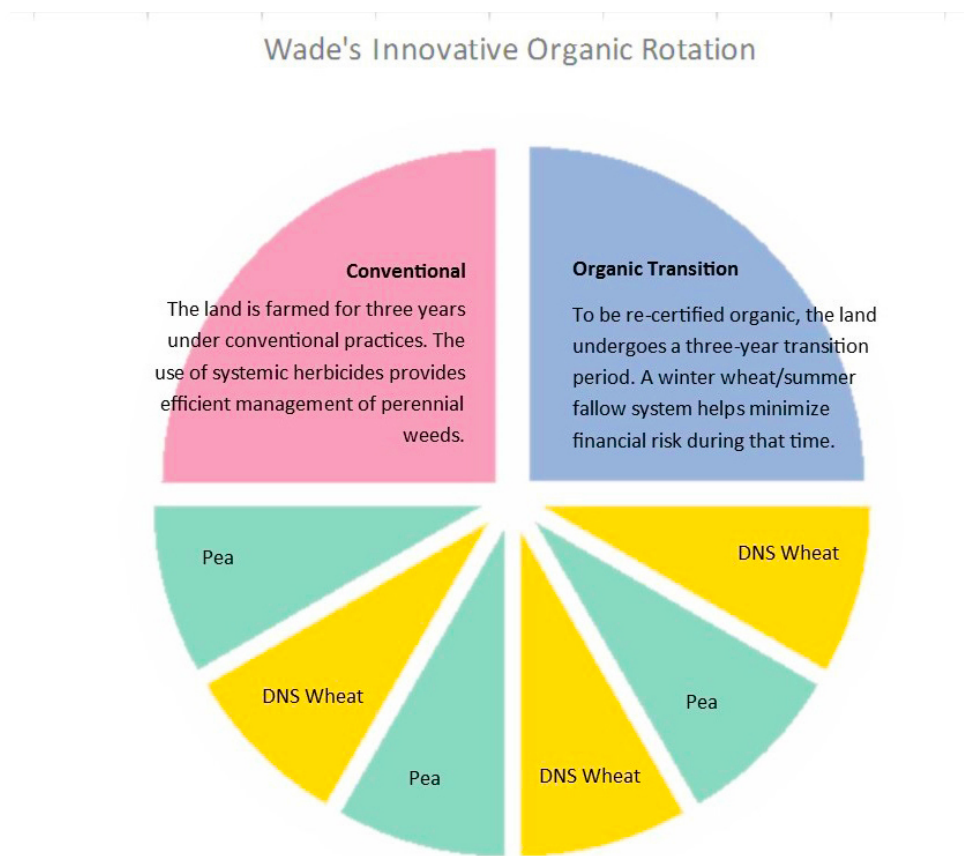


Figure 3.4. Wade proposes a 12-year rotation including three years under conventional practices. Dividing the land would minimize financial risk, as only a fourth of the acreage would undergo organic re-certification in any given year.

“It would be a 12-year rotation, with the organic ground split into fourths,” he explains. At any given time, three-quarters of the ground would be certified organic with the rotation being summer fallow–canola or peas–Dark Northern spring wheat. Meanwhile, the remaining quarter would be farmed conventionally for three years to manage persistent perennial weeds with the use of systemic herbicides. The quarter would then be transitioned back into certified organic production before taking another portion of the land out of organic for weed management purposes.

“I might be a hundred years old when I have that system down!” jokes Wade.

“My goal always has been to get the ground I own healthier than how I [inherited] it,” he explains when describing his conservation ethics. Wade’s desire to leave a legacy is what keeps him motivated to look for innovative ways to farm.

What does the law say?

Crop insurance for certified organic production

As of 2014, the Risk Management Agency offers organic producers the possibility to insure some certified organic crop based on an organic price rather than non-organic price (forage crops or pastures are not eligible for this organic price option).

Before 2014, organic producers had to pay a 5 percent surcharge on crop insurance premium. Now there is no surcharge, but there is also little yield data available for organic crops. Consequently, if you are new to organic farming, you can only insure a certified organic crop at 65 percent of the average non-organic yield in your county.

For more information, visit the [Risk Management Agency Website](#).

4. Nathan Stelzer, Azure Farms, Dufur, Oregon

Location: Wasco and Sherman Counties, Oregon

Annual precipitation: 12 to 15 in.

Irrigation: None

Dominant soil types: Wamic loam in Dufur; Walla Walla silt loam in Moro

Crop rotation: Winter wheat–summer fallow; some spring cereals; some legumes

Nathan Stelzer (Figure 4.1) farms more than 4,000 acres organically, most of them in a dryland winter wheat–summer fallow rotation. About half of his land is located near Dufur, Oregon, and was farmed by his grandparents, and then by his father, who transitioned the entire farm to organic production in 1973. Nathan’s family acquired another farm near Moro, Oregon, which they also transitioned entirely to organic production. Nathan has been farming ground in Moro for seven years.

Getting started

Nathan’s father was not satisfied with the use of synthetic nitrogen fertilizer. As the years went by, he noticed that he constantly needed to add more nitrogen to obtain the same yield.

“[Initially] he would get 35 to 40 bushels per acre without adding any nitrogen. At first, he increased his yield to 65 to 75 bushels per acre by putting down 10 lb of nitrogen. But as the years went by, he had to put down 20 lb, then 30 lb of nitrogen to get to that same 70 bushels of wheat,” recalls Nathan.

His father was also concerned about the health of the water table and neighboring rivers, and wanted to change his farming practices.

“He quit using chemicals on the entire place in 1973,” relates Nathan, who was born that year. For a while, his father farmed using organic practices but without being certified. “He hauled in the grain on the conventional market for years,” says Nathan.

When Nathan’s brother David got involved in marketing, the two brothers planned to market their own grain.



Figure 4.1. Nathan Stelzer in an organic winter wheat field near Dufur, Oregon. (Photo by Louise Lorent, WSU.)

“We decided to sell our products as labeled organic, so we went through the certification around 1993,” recalls Nathan.

The Moro farm was farmed conventionally up until his family purchased it, and his nephew did the transition to organic.

“He had to farm for three years without using any synthetic fertilizer or pesticides, and then go through the farm history to make sure there were no chemical residuals [of prohibited substances] in the soils,” explains Nathan.

Crop rotation

Nathan’s biggest crop is soft white wheat: “It’s what grows best here.”

He also grows barley and rye.

“We divide the places in half between summer fallow and green grains,” he explains. With 12 to 15 in. of annual precipitation, Nathan says he falls short of moisture to afford to raise an annual crop.

“The moisture mostly comes down as winter snow in Dufur, while Moro gets more spring and summer rains.” He also has 140 irrigated acres in Dufur, on which he raises oats and garbanzo beans.

Nathan and his son also raise certified organic beef cattle (Figure 4.2). Half of the Dufur farm is scab ground, where Nathan keeps the cow/calf pairs. About 40 acres in Moro are not farmable and are grazed by the steers and heifers that Nathan doesn’t want to breed. He and his son manage a herd of about 20 cow/calf pairs of Piedmontese, “a lean, beefy, but not stocky” breed.

Soil fertility management

Nathan has been experimenting with commercially available organic fertilizers since he started farming. At first, he used fish fertilizer, which had 12 percent nitrogen content. He put the fertilizer in a grain drill and drilled it into the summer fallow ground after tillage operations.

“It worked ok,” says Nathan, “except it would open the ground and I would lose moisture.”

The fish fertilizer was hard to obtain, so Nathan eventually switched to a pelletized fertilizer derived from chicken manure. The product, a 4-4-4 fertilizer, does not contain as much nitrogen as the fish fertilizer, so Nathan has to put a lot more product in the ground.

“I tried to put it in with a regular drill, just like the fish fertilizer, but it would take me four passes to get enough on,” he says. He tried to put the fertilizer in with an air drill, but “the pelletized [product] was so abrasive it was like blasting sand in the machine.” It also caused moisture loss and was heavy to pull, using a lot of fuel and wear.



Figure 4.2. Nathan and his son raise Piedmontese cattle. (Photo by Louise Lorent, WSU.)

“I had to put 600 lb [of product] to get to [about] 20 lb of nitrogen per acre [24 lb of nitrogen for a 4-4-4 product], which was on the low side of what I wanted, but I could not afford to put more with the equipment I had,” explains Nathan.

He eventually acquired a spin spreader (Figure 4.3). The last five years, he spread out the manure before plowing it under.

“The spreader really helped my speed. It spreads the product 70 ft wide, is easy to pull, and does not use too much fuel,” says Nathan. He can now cover 120 acres in 2 hours when he used to fertilize 60 acres in one day using the drill. He uses the 4-4-4 pelletized fertilizer in Moro, and raw manure in Dufur, which is not tested for nitrogen content.

“The pelletized [product] is more expensive, but easier to spread,” explains Nathan.

He also composts as much as possible. He gets waste product from an organic juice factory and feeds the apple and carrot pulp to his cattle. The rest, including orange peels, goes to the compost pile.



Figure 4.3. Rear view of Nathan’s spin spreader. (Photo by Louise Lorent, WSU.)

Nathan is satisfied with his method of applying soil nutrients, but wants to experiment with foliar sprays like kelp or liquid fish fertilizer to complement the crop needs later in the season.

“The manure does ok. The wheat looks great in the fall and the spring, but it’s stressed at the end of the spring.” He has been spraying zinc and boron on the soil in the past, and says it increased his yields and his test weights.

Nathan believes maintaining a proper balance in the soil is important for crop health.

“I can grow great wheat with 40 lb of nitrogen per acre,” he says, “but if I put more by overlapping or because of spill, my wheat is dark green but more prone to diseases.” He thinks organic practices improve nutrient availability in the soil, by having “the microbes working for the plant.”

Since he has been working on the Moro farm, he has observed improving water-holding capacity, something he attributes to increased organic matter. He also notes that the population of earthworms has been growing.

“I never saw an earthworm the first years we [farmed] in Moro. Now I can dig anywhere and find plenty.” He adds, “The [soil] pH has rebalanced at around 6.5 to 7 [since we got the place].”

Weed and pest management

Although Nathan works mostly in a winter wheat–summer fallow rotation, he incorporates spring cereals in his system.

“Doing spring grains a couple of years in a row helps break the winter annual weed cycles,” he explains. He hopes to include different crops in the future and is experimenting with field peas.

“I was going to do winter peas, but I ran out of time in the fall so I planted spring peas instead.” Nathan explains that organic peas are in demand for a high-protein animal feed, as a non-genetically modified organism (GMO) alternative to soybeans.

Nathan uses a moldboard plow during the summer fallow rotation before planting winter wheat.

“It has a bad reputation, but in this dry area we don’t run into problems like stubble rotting underground,” explains Nathan. He plows in the spring, before the summer fallow. Moldboard plowing takes special care to keep the moisture in. Nathan explains that the soil in Moro is lighter than in Dufur, which can result in stubble sticking out at the surface.

“All that straw can wick the moisture out,” he adds. He found that mowing the stubble in the fall after harvest, then plowing it in, takes care of that problem. After plowing, Nathan rod-weeds two or three times before seeding.

“It works well to seal the moisture in and to prevent weed emergence.”

He also tried to chisel plow, as it is faster than moldboard plowing, but “it tends to bring more weed problems. Weeds are brought up to the surface and germinate as soon as the rain comes [whereas the moldboard plow buries weed seed deeper].” He has found that chiseling, then rod-weeding to obtain a fine dust layer at the surface works well for spring grains, but is too hard to time properly for winter crops.

Nathan also does in-crop cultivation using a rotary hoe (Figure 4.4) in his winter cereals.

“Timing is critical. The ground needs to be soft, the weeds small, and the wheat well established.” Nathan says he needs a heavy harrow for more aggressive work.

“I found one for this year but it was too late in the season.”

Timing of planting is another of Nathan’s tools for weed management. If he can plant before the first rain in the fall, the wheat can get ahead and outcompete weeds. If rain comes before planting, he makes sure to cultivate weeds prior to seeding. In the event that rain comes right after seeding, Nathan replants everything.

“At this point, my crop loss from the weed competition would be greater than the cost of reseeding,” he explains.



Figure 4.4. Nathan's wheat after a pass with the heavy hoe. (Photo by Louise Lorent, WSU.)

For weed and moisture management in his winter cereals, Nathan:

- **Mows the stubble after harvest and incorporates it into the soil to prevent moisture loss from moldboard plowing;**
- **Moldboard plows in the spring before a summer fallow and prior to planting;**
- **Dust mulches with a rod-weeder after plowing and before seeding; and**
- **Uses a heavy hoe to manage small weeds post-emergence in well-established crops.**

In spring cereals, Nathan:

- **Chisel plows prior to planting to “flush weeds out.”**

Nathan keeps and cleans his own seed on the farm.

“I don’t know of any seed-grade organic seed sources,” he explains. (See [sidebar](#) in David Ostheller’s case study for information on using the seed variety you want.) The advantage of having his own grain-cleaning facility is twofold: it limits weed seed contamination of his crop seed and it allows him to ship clean grain to his buyers.

Perennial weeds are more challenging to control. Nathan thinks some weed infestations are a sign of nutrient imbalance in the soil, and he has experimented with spraying fertilizer to address deficiencies. He tried, unsuccessfully, using vinegar as an organic, non-selective herbicide. He also tried using a lightning weeder. Originally developed for weed management in sugarbeet, the implement functions by burning weeds with a rod under high voltage.

“It worked if the conditions were just right, but with moisture it tended to ground into the soil,” explains Nathan.

For Canada thistle, Nathan now chisel plows the infested patches as deep as possible (going 12 to 14 in. deep) after harvest and after summer fallow.

“I lose moisture but I have to do it,” he says.

Field bindweed is also a challenging perennial weed to manage for Nathan. He avoids working the ground with dead bindweed.

“I want to make sure it’s gone before risking spreading it by cultivating.”

To keep field bindweed (morningglory) contained, Nathan avoids cultivating the bindweed-infested patches.

Insects have not been a problem on Nathan’s farms, except for a brief infestation in a couple of storage bins in Dufur.

“I stored my wheat with diatomaceous earth. A scoop shovel for 300 bushels was enough to take care of the problem,” he says. He also is careful to aerate the bins in the fall to bring the temperature down.

Marketing and certification

Nathan works in partnership with his brother David, CEO of Azure Standard, an organic food company that sells directly to private customers, food clubs, and retailers.

“Almost everything I grow is sold through Azure Standard,” he says. With about 950 acres in Moro and 400 acres in Dufur, Nathan grows more soft white wheat than Azure Standard can sell, so he markets some through Bob’s Red Mill and Grain Millers and also ships some to Japan.

“I contract if my bins are full and I need the space, but I do not contract before a crop is in the ground,” he explains.

Nathan can hold 50,000 bushels in the bins in Moro and another 24,000 bushels in Dufur. He also sets aside storage of a 2,500-bushel capacity for rye and other crops.

“I try not to mix years in a bin to prevent bug infestations,” he explains.

Nathan’s operation is certified organic through Oregon Tilth. The organization conducts an inspection every year.

“They can conduct an inspection unannounced, but I never had that happen.” Nathan explains that documentation is very important for the certification process. “For example, you need to prove there was no organic seed available if you used conventional untreated seed.”

He notes that more is better when it comes to documenting decisions, operations, sources, etc.

“I keep a daily journal of everything I do,” he says. If extensive record keeping is necessary for a smooth certification inspection, Nathan thinks it also helps him improve his practices.

“It’s probably a good habit for everyone to get into,” he notes. “For instance, by keeping detailed records, I found out my yield potential for spring wheat was higher the earlier I could get out in the field. If I can plant in March, I can expect about 60 bushels an acre. It falls to the 50-bushel range if I plant in April and down to 35 bushels when I plant in May.”

Benefits and challenges and advice for other growers

“My dad converted the land to organic when I was born,” says Nathan. To him, farming organically is a way of life.

“I think it produces better food, and that better food brings in better health.” Nathan also mentions that he feels safer producing organic crops. “I don’t have to worry about wearing protective equipment.”

His advice to a grower interested in organic farming is to be persistent.

“Don’t give up. Stick with it,” insists Nathan, who is always excited to try new solutions to surfacing challenges. He plans to research peas as a rotational crop in the near future, among other ideas.

“New ideas don’t always work, but I always have been able to overcome obstacles”, he says, insisting that facing new problems positively is key to finding long-lasting, efficient solutions. “It could seem easier to go out and spray herbicide sometimes, but I think the benefits of organic outweigh the challenges.”

Nathan finds that keeping detailed records for his organic certification gives him valuable information about his farm.

He points out that an advantage of organic farming is the ability to name your own market, “to a point.” He also says his father noticed less disease occurrence and fewer pests – like aphids – after he made the transition from conventional to organic. He attributes that change to better soil and crop health, leaving less room for insect or pathogen attacks.

Above all, Nathan believes his farming system brings forth life. “Farming organically makes me closer to God,” he concludes.

What does the law say?

Use of raw manure

The use of raw animal manure is restricted to specific conditions. These conditions are known as the 90/120-day rule, and are detailed in § 205.203(c)(1) of the National Organic Program. When applied to crops destined for human consumption, raw manure must be applied and incorporated into the soil:

- A minimum of 120 days prior to harvest when the edible portion of the crop is in contact with the soil (this would concern vegetable crops); and
- A minimum of 90 days prior to harvest for all other food crops.

Raw animal manure can be applied without restrictions to non-food crops: fiber crops, cover crops, and crops for animal feed.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

5. Seth Williams, W-7 Farms, Edwall, Washington

Location: Lincoln County, Washington

Annual precipitation: 13 to 14 in.

Irrigation: None

Dominant soil type: Hanning silt loam

Crop rotation: Alfalfa/grass mix–spring cereal (wheat, barley, or oats)

Seth Williams, the son of an organic farmer and the grandson of conventional wheat farmers, has been farming organically for 20 years on 1,050 acres near Edwall, Washington. Half of his land is in pine forest and not currently in agricultural production. All of his cropland is certified organic.

The main scope of his operation is beef production. Seth currently feeds around 100 head of cattle including last year's calves. He keeps Galloways, an Irish breed close to the Scotch Highlands.

"They are smaller and hardier than other breeds," explains Seth, who adds that they are highly rated for grass-fed meat quality. He keeps his cattle on pasture and produces his own forage (an alfalfa/grass mix). He produces spring wheat, barley, and oats, mostly for grain production, in rotation with his forage crops.

Getting started

"I learned the value of good food by growing up on a farm," says Seth (Figure 5.1), who recalls that his grandparents had an organic vegetable garden alongside their conventional wheat operation. He learned organic methods of production from his father, who was already farming organically in the 1960s.

Seth also was inspired by his college experience.

"I went to Evergreen State College, and I wasn't in the agriculture program, but I was exposed to things like the CSA [Community Supported Agriculture] movement."

As part of his curriculum, he conducted his own independent study of local farms. Later on, he got involved with Tilth Producers of Washington, an organization promoting sustainable farming practices.



Figure 5.1. Seth Williams comes from a family with a deep interest in organic farming. (Photo by Louise Lorent, WSU.)

"I was a board member back in the 90s and had connections with other growers, access to books and farming conferences," he says.

Both his family background and his personal education contributed to his interest in organic farming.

"By the time I took interest in farming, I was mostly attracted to the organic aspect," he concludes.

Crop rotation

Seth keeps his stand of alfalfa and perennial grass mix up for seven years before rotating to a cereal. He mostly grows a hard red spring wheat, but will sometimes plant barley or oats instead.

"I also tried a hard white spring, but I've never done a winter wheat," he says.

The hard red spring wheat seed Seth uses is from a variety that his father used and saved year after year.

"It has worked well for me," he says. He mentions protein levels have been on the low side certain years, mostly due to the weather, but points out, "I direct market, so it's not quite as important for me to meet certain standards."

He keeps his ground in cereal production for two to three years before returning the fields to alfalfa/grass forage production. His rotation is not set in stone. Depending on his needs, his small grain acreage can vary from 0 to 50.

“I planted barley this year [2013], but I will cut it for hay,” he says.

On small plots, Seth has tried to grow canola, mustard, buckwheat, flax, and lentils to experiment with alternative rotational crops.

“I grew an acre or two of mustard seed ten years ago [in 1994] to try and make biodiesel,” says Seth. He was able to harvest it using his combine, but his plans to press the seed fell through and he was not able to produce biodiesel.

Soil fertility management

To supply nutrients to his cereal crops, Seth relies on his rotation and his animals. During the winter, he feeds his cattle on the forage fields.

“Between the alfalfa [nitrogen-fixing] residues, the leftover hay, and the manure left by cattle, I have enough nitrogen,” he says. He has not had to rely on external sources of manure.

Weed and pest management

Seth uses conventional tillage methods to prepare his soil for cereals. He disks, then cultivates or harrows depending on the field and the level of soil clumping. He generally does it in the spring prior to planting, and avoids working the soil in the fall.

“I try to keep tillage [and soil disturbance] to a minimum.”

Seth plants cereals with a 7-in. spacing drill: “It has packers in the back, which help with [preserving] soil moisture.”

He plants as early as possible, usually in late April or early May.

Seth thinks his forage crop is key to keeping weed pressure to a minimum.

“It corrected weed problems like Canada thistle,” he mentions. He used to grow only alfalfa, but noticed it encouraged grassy weeds like downy brome and bulbous bluegrass.

“I don’t have [these weeds] now that I plant an alfalfa/grass mix,” he says. His perennial stand of forage crop also has the advantage of requiring minimum tillage, thereby reducing potential for soil erosion.

An ongoing weed problem for Seth is Canada thistle, even if alfalfa helps keep its pressure down. He uses a few goats to graze around the place, and although cows will eat most weeds, “they don’t seem to like the [Canada] thistle unless after a freeze in the fall.”

Seth’s forage crop, an alfalfa/grass mix, serves both as a weed competitor and a nitrogen fixator for cereal crops that follow.

For annual weeds, Seth also uses mowers. He does not do any in-crop tillage, except for harrowing two or three days after planting.

Marketing and certification

Seth says the farm was first certified in 1990: “A lot of the land was in CRP [Conservation Reserve Program] in the 80s, so transitioning was not an issue,” he remembers. He is certified through Washington State Department of Agriculture (WSDA). “The certification [process] is based on trust, so there is a heavy hand on making you document everything you do,” says Seth.

Although the entire ground farmed is certified organic, the animals aren’t.

“They probably could be, but at this point, the certification process [for cattle] is not worth the price premium for me,” Seth explains. If he wanted to sell his grass-fed beef as certified organic, he would need to have them slaughtered and processed by a certified organic butcher, who can be hard to find.

Seth sells most of his cattle for meat, and has them butchered on the farm. He advertises through Craigslist and word of mouth. He also sells some of his cows for breeding stock.

All of Seth’s hay is fed to his cattle. He sells his cereals directly in 50-lb bags through Craigslist.

“That brings in more demand than I can fill,” says Seth, who adds that people buy his grain for personal use, or for chicken feed. He also sold some of his grain to stores in Spokane, but “that was a small volume.” He sells wheat as grain, and grinds some for his own consumption, but mostly harvests barley and oats in the early milk stage for hay production.

Seth mentions that recent concerns about gluten might shy him away from growing wheat, barley, and oats (except for feed production), as the demand for direct-market grains might diminish. He is thinking about diversifying his grain production with other crops: quinoa, lentils, flax, and ancient grains like emmer, kamut, and spelt. (See [sidebar](#) in Brad Bailie’s case study for information about ancient grains.)

Seth either uses his cereal production on the farm or markets it directly to the consumer.

Benefits and challenges

When asked what is his most pressing challenge, Seth ponders for a while.

“I need more help on the farm,” he says.

He thinks growing crops is more challenging than cattle, and mentions the weather has been difficult to work with.

“I’ve had more and more windstorms in the summer lately, which in some years displace up to 50 percent of the crop in certain fields.”

Weed management and soil fertility are also pressing issues for Seth.

“The soil has been farmed for at least 100 years and is deficient in a lot of minerals and elements like sulfur,” he says. He adds that it is not practical for him at the moment to spend too much time or many resources addressing these deficiencies.

Another challenge simply has to do with the scale of his operation.

“Most machinery is now made for large-scale operations (Figure 5.2),” he points out. His combine is 18 ft wide and his drills are 20 ft and 35 ft wide, which makes his equipment well suited to the size of his farm, but he is concerned about future purchases as new equipment continues to increase in size and capacity.



Figure 5.2. Increasing acreages of conventional grain farms has led to the manufacturing of larger farm machinery. (Photo by Diana Roberts, WSU Extension.)

Future plans and advice to other growers

Seth’s recommendation to someone starting to farm organically is to diversify the operation.

“Don’t put all your eggs in the same basket. Consider livestock, and alternative crops for your rotation,” he recommends. He points out that these strategies not only reduce financial risk, but also help tackle agronomic problems like weeds and soil fertility.

Seth has many ideas he’d like to develop on his farm. In the short term, he wants to plant trees along fences and field borders to provide windbreaks and habitat for native species. In the long term, he would like to find ways to incorporate trees with crop production, and perhaps produce fruit. His ideas even include the start of a nursery on his farm to provide the region with well-adapted tree species.

A big part of Seth’s plan is community-oriented.

“I’d like to get more people involved, probably as residents. Hopefully I could become less based on fossil fuel and machinery and more on people.” Seth is also thinking about incorporating more renewable energies, like wind or solar electricity, on his farm.

Seth attributes the biodiversity (ladybugs, praying mantises, and prey birds) he sees on his farm (Figure 5.3) to his organic practices. His main reason to stay in organic, though, has to do with people.

“I think it’s the right thing to do for the consumer.” Farming organically appeals to him as way of life, as well as a way to do business.



Figure 5.3. Ladybird beetles (*Hippodamia convergens*) are important biocontrol agents for aphids and other insects. (Photo by Diana Roberts, WSU Extension.)

What does the law say?

Organic meat production

To be sold as organic, meat must not only come from animals that have been raised under organic practices, but also have been slaughtered by a certified organic processor.

Regulations require, among other things, that animals must be fed only organic feed. In addition, ruminants must graze organic pasture. The organic livestock producer certification process is similar to the one in place for crop production.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Livestock Producers [here](#).

6. David Ostheller, Ostheller Farms, Fairfield, Washington

Location: Spokane County, Washington

Annual precipitation: 14 to 16 in.

Irrigation: None

Dominant soil type: Naff-Garfield complex

Crop rotation: Spring wheat–spring pea–spring pea; continuous alfalfa

David Ostheller is the fourth generation of his family to work on his farm near Fairfield, Washington. He has been farming on his own since 1980, after his father passed away. An early adopter of direct seeding (no-till) on his Palouse loam soils, he farms approximately 1,800 acres in a dryland wheat–lentil rotation. His organic operation used to cover 70 acres. Currently, 26 acres remain certified and are all planted in alfalfa.

Getting started

From direct seeding to organic

“I have always been interested in organic farming,” David says. He defines himself as an outsider, always enthusiastic for alternative approaches in life.

“I have been a vegetarian for a number of years, I studied yoga, and I even tried my hand living in a commune.” In a similar alternative approach, he tried farming without chemicals years before starting the organic certification process, using cover crops and in-row tillage.

“But in-row tillage was not precise enough and it caused soil to run off the hills, with the slopes I was working on,” he explains. Eventually, his interest in alternatives to chemicals led him to be involved with a research project on dryland organic farming conducted by Washington State University (WSU), and he started the certification process in 2005.

David embraced no-till farming early in his farming career.

“But it’s a type of production that is very dependent on herbicides,” he notes. “My first hope was to be able to marry direct seeding and organic farming.” In addition to being involved with research at WSU, David also sought information from WSU Extension, attended workshops, and met with other organic growers.

“I started the certification process hoping I could solve problems as they appeared.” With his “certification clock” beginning on January 1, 2006, he started with a spring barley crop fertilized conventionally in the fall of 2005. His barley crop in the first year of the three-year transition period benefited from the fall-applied conventional fertilizer.

Crop rotation

Knowing he would have to stay away from winter crops to facilitate mechanical weed control (Figure 6.1), he planned first a three-year rotation that would include one spring cereal and two spring legumes.

“Now that I know I can grow canola, I will probably go with one spring cereal, followed by a spring legume, followed by spring canola,” he says. In his rainfall zone, crops cannot compete with weeds that overwinter, thus the emphasis on spring crops.

Working with the region’s challenges

Finding certified organic seed for locally adapted varieties was difficult.

“I couldn’t source any organic seed for my area,” recalls David. Although he was able to find organic certified seed for his green manure peas, other crops were a challenge. Eventually, David used non-treated seed of WSU varieties. “Due diligence” required him to prove he tried to find organic seed for his desired variety before turning to conventional, non-treated seed.

“Since peas and lentils are grown more widely in the Midwest and in Canada, seed might be easier to find nowadays,” he notes.



Figure 6.1. David Ostheller uses mechanical weed management methods prior to seeding and within a newly emerged crop of lentils. (Photo by Diana Roberts, WSU Extension.)

David built on his previous experience with in-row tillage and mechanical weed control. He started his organic acreage on the flattest part of the farm, hoping it would facilitate passes with tillage equipment and limit soil erosion. But that choice came with disadvantages.

“The flat field I worked in did not drain well...then moisture would bring weeds and keep me off the field.” And in organic production, timing is critical for weed management, David says. “When you rotary hoe, the weeds need to be of a certain height, the soil moisture needs to be just right....”

Hopefully the rotary hoe pass is followed by a few dry days to fully kill weeds, he says. Timeliness in weed management can be heavily impacted by high precipitation.

Soil fertility management

David supplies nitrogen to his organic crops using pulses in his crop rotation. He also grows a green manure cover crop that he plows down using a disk or a light tillage implement.

“Largely, I can live with reduced yields due to the lack of fertility if the premium for organic is high enough,” he explains.

For David, organic production has its advantages for the soil as well; organic matter seems to break down better and allows for a thriving microbial life.

He adds, “I cannot grow hard red wheat in this region, so protein content is not much of an issue.”

David finds that receiving a premium for organic compensates for the lack of soil fertility and the lower yields that come with it. Planting soft white wheat, instead of hard red wheat, can work better with reduced soil nitrogen levels.

One year, David added a commercial organic fertilizer as an organic source of nitrogen. He used Perfect Blend (4-4-4), a biotic, pelletized fertilizer derived from chicken manure that he sourced from a company in Othello, Washington. David could band it with his seed at planting.

“It did not plug the drill and went in really well,” he says. He would use that tool again in the future to fertilize his cereal crops. “Organic would work really well for a farm that had an on-site cattle operation,” he remarks.

Weed and pest management

“Weeds are my number one stumbling block,” asserts David. He uses tillage, crop rotation, and delayed planting to manage annual weeds. Delayed planting (sometimes called stale seedbed) is a technique consisting of preparing the soil several times before actually planting. Each soil preparation can bring up a flush of weeds that can be controlled using light tillage equipment.

“I have three essential pieces of equipment for the organic side of my operation: a skew treader used in place of a rotary harrow (Figure 6.2), a rotary hoe (Figure 6.3), and a sweep [undercutter] (Figure 6.4).”

He uses the rotary harrow prior to planting, and the hoe both prior to planting and within the emerged crop.

“The harrow is not aggressive enough,” he explains. “It will flick weeds out without truly rooting them out.” After planting, he makes several passes with the rotary hoe. “That’s a lot of trips,” he acknowledges, “but they are all fairly light duty.”

He also has a rod-weeder with cultivator shanks, but he limits its use as it tends to form a compaction layer in the soil.

“The rod-weeder really needs a dry, dusty soil to work well, otherwise weeds come right back up.” David uses the sweep after harvest or after mowing down a cover crop to cut the roots (to prevent further growth), loosen the soil, and allow better water penetration.



Figure 6.2. David Ostheller with a skew treader that he uses as a rotary harrow for weed management prior to planting. The angle of the implement can be adjusted to increase or decrease the aggressiveness of its action. (Photo by Diana Roberts, WSU Extension.)

Tillage operations and delayed plantings are tools that can be jeopardized by untimely moisture, as explained above. David adapted his rotary hoe (Figure 6.3), making it 50 ft wide to be able to cover a lot of ground fast, but still the weather sometimes makes it near impossible to get out in the field on time.

“My best year for weed control had a dry spring,” recalls David. “I was able to bring up several flushes of weeds prior to planting, but still had enough moisture to successfully plant wheat later in the spring.” But the following year, a wet spring brought much higher weed pressure and few opportunities for a pass with the rotary harrow or hoe.

David hasn’t had perennial weed problems, which he supposes could be due to a low soil fertility that cannot sustain heavy infestations. He used the sweep to cut off taproots in a few patches of Canada thistle and morningglory (field bindweed) (Figure 6.4). Since he put his organic acreage in alfalfa, he hasn’t seen perennial weeds become a problem; crop competition and regular mowing prevent the weeds from growing and setting seed.

Insects and pathogens do not pose much of a pest problem for David.

“I grew yellow peas, which did not seem to be affected by weevils,” he explains. He also uses varieties with built-in tolerance for diseases. “For soft white wheat, I used Louise, which has a full package for pathogen tolerance,” he says. Since he could not source the variety Louise as certified organic, he used non-treated conventional seed for the variety.



Figure 6.3. David Ostheller has adapted several sections of rotary hoe to make the implement 50 ft wide for weed management both prior to seeding and in-crop. (Photo by Diana Roberts, WSU Extension.)



Figure 6.4. David Ostheller uses an undercutter (sweep) for post-harvest weed management. (Photo by Diana Roberts, WSU Extension.)

To manage weeds, David uses:

- Pre-plant tillage with a rotary hoe and rotary harrow;
- Delayed planting, to kill several flushes of weeds; and
- Post-harvest tillage using a sweep.

For optimal results, timing of each operation is critical.

Marketing and certification

“I cannot contract my organic production because of the small scale of my operation,” he explains, “and I’m too limited in storage to be able to deliver big shipments.”

David uses one grain bin exclusively for his organic production, to separate it from his conventional production. In addition, before each harvest he thoroughly cleans his semi-truck, which can hold 1,000 bushels. That allows him to store all of his organic crop.

“But I can’t sit on it. I need the bin and the truck for the following year, so I have to sell everything immediately,” he explains.

Harvest timing is critical for storage as “it has to be nicely dry.” As an additional precaution, David cleans his crop using a scalper to remove most weed seeds, which have higher moisture content.

The thorough record keeping required to be certified organic works to David's advantage by enabling him to plan his crop management proactively.

"There are some organic [biocontrol] agents available against storage pests," he mentions, "but I haven't ever needed them."

"I sell most of my organic production for feed for chickens, hogs, or cattle," David says. Working on a small scale as he does, it is challenging to obtain contracts to sell his crop as food grade, which would allow him to get a higher premium. But he gets about the Portland price for his crop and his buyers pay for shipping, which allows him to stay ahead.

David says the workload associated with the organic certification process has been "reasonable."

"The whole form is very long, but a lot of the questions did not apply to my farm," he explains. He keeps track of all his invoices and a daily journal of his operations. He estimates it takes him half a day a year for inspection, plus a few hours a month for log keeping. "But I'm used to it," he points out, "as most of the grant farm programs I've been involved with require a lot of record keeping."

He notes that extensive record keeping actually helps him, as organic farming requires constant and close observation. "When something goes wrong, there are no Band-Aid solutions in organic," he notes. Keeping track of the weather, for instance, enables to him be proactive.

Benefits and challenges

David sees several benefits to organic production. For one, he believes the practice seems less taxing on the soil.

"Even in organic, I haven't had to do any deep tillage, and I think I have a higher population of earthworms in my organic acreage."

He asks, "How would you like this to show up on your desk?" as he shows a high five-figure invoice for fertilizer for his conventional fields. "It's expensive to farm conventionally," he notes.

To this day, his most pressing challenges to address for the future of his organic operation are seed sourcing, weed management, and marketing.

"Seed sourcing is my weak spot for my organic certification." With few locally adapted varieties available as certified organic seed, he has to demonstrate "due diligence" before he can use conventional non-treated seed, so he has to be fastidious.

"I have documentation proving my co-op tried to source organic seed, the variety I wanted. They tried three different suppliers but failed."

Future plans and advice to other growers

A wild oat infestation made David scale back his organic acreage to 26 acres, all currently in alfalfa production.

"I wanted to expand, not reduce my organic acreage." But the many production challenges he experienced forced him to put his organic operation on hold.

"Wild oat [growth habit] is much too closely related to wheat to find an efficient ecological control tool," he says.

Growing alfalfa on all of his organic acreage allows him to build nitrogen fertility and reduce weed pressure while coming up with other ideas and future plans. "I'm still very encouraged by the experience," he says. "I learned a lot."

He would consider working with other growers to market his grain in bigger shipments. He uses the email listserv platform and electronic bulletin board provided by WSU Extension to find buyers for his grain.

For weed management, he believes a great tool would be the use of an organic, pre-plant, burndown herbicide. "And you could marry that with precision agriculture for efficient in-row cultivation," he adds. "I could grow wheat with wider row spacing, for example 12 in., to be able to use in-row precision tillage."

In the near future, though, he is considering incorporating alfalfa in his rotation. "I love its competitiveness and the toll it takes on the weed seed bank."

He envisions a rotation including a spring cereal followed by a spring legume, then by canola or mustard. He also might work in a green manure (cover crop) consisting of clovers mixed with a taproot crop, like radish. David advises growers interested in organic production to seek information from Extension and other growers.

"You can't go in this by yourself," he insists. "I want to share my knowledge with others."

What does the law say?

Using the varieties you want

Regulations regarding seed and planting stock are detailed in § 205.204 of the National Organic Program. You are allowed to use conventionally produced seed if an equivalent organically produced variety is not commercially available. Whether a variety is “equivalent” to another is determined by you, the grower, taking into account maturity dates, disease resistance, etc. If you have to use conventionally produced seed, you must document three things:

- Evidence that you contacted at least three suppliers in an attempt to source organic seed;
- Verification that the conventional seed was not genetically engineered; and
- Verification that the conventional seed has not been treated.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

WSU Extension maintains an email listserv that helps connect buyers and sellers of organic grain. Subscribers also receive Extension information pertinent to organic production. The email listserv is free, confidential (email addresses are not visible), and clear of spam and viruses. To sign up for this service, email Diana Roberts at robertsd@wsu.edu.

WSU Extension now complements the email service by storing all announcements of organic grain for sale or wanted on a searchable, electronic bulletin board. The bulletin board is located at <http://smallgrains.wsu.edu/organic-grain-sales-bulletin-board/>.

WSU assumes no responsibility for either party in negotiating sales or contracts. It is the responsibility of the buyer and seller to determine the price, quality, amount, delivery, and certified organic status of any grain bought or sold.

7. Ted Lacy, Lacy Farms, Worley, Idaho

Location: Kootenai County, Idaho

Annual precipitation: 25 in.

Irrigation: None

Dominant soil type: Cald silt loam

Crop rotation: Spring pea–spring wheat–spring pea–spring barley

Ted Lacy farmed conventionally for more than 30 years, before placing all of his acreage under a Conservation Reserve Program (CRP) contract. Today, he has around 100 acres back in production, all certified organic. He grows peas, spring wheat, barley, and oats, and also raises hay on the draws and flats of his farm.

Getting started

It started with the soil

Ted’s interest in organic production was spurred by a concern for both human and soil health.

“When I put all of my farm into CRP in 2004, something was wrong with my soils,” he says. He also believes some of the conventional farming practices were detrimental for people.

“I remember spraying DDT on peas in the late 1950s or early 1960s. The valley was covered in white, and we were breathing right into it. We didn’t know any different,” he recalls.

He started reading extensively on soil microbiology.

“I’ve learned more about farming since I quit farming, than I did all those years farming!” He especially learned a lot from author Charles Walters and his publications through Acres U.S.A. After reading extensively about soils, he realized he would never go back to farming conventionally.

“For me, organic production is a very personal conviction,” he explains.

He first had in mind to raise organic chickens, but could not find any source of organic chicken feed. He decided to grow ingredients for the chicken feed instead. Some of his CRP fields died in 2009, halfway through the contract.

The field had been seeded into blue grass and it just died. He calculated that it was not worth replanting those fields and waiting for re-establishment of desirable species. He decided to take the field out of CRP and the way it worked out, he did not have to pay any penalty.

Because it was former CRP land, and there were no prohibited substances applied, Ted was able to immediately transition to certified organic production without having to wait three years to be certified. He started on a small scale, with 30 acres in 2009.

“It was a shot from the hip,” he says, adding that he had no first-hand experience with organic production but thought he could learn along the way. When his ten-year contract expired in the fall of 2013, he took more land out of CRP to expand his total organic production acreage to about 100 acres.

From CRP to crop production

Ted read numerous books published by Acres U.S.A., but “they mostly targeted Midwestern farms.” His environment, and especially the soil, is very different and so are his crops, so he complemented this information with what he found online. He also used material from ATTRA (the National Sustainable Agriculture Assistance Program), “mostly for chicken production.”

Transitioning directly from CRP to organic production had its advantages. Aside from not having to go through a three-year transition period, the weed pressure was relatively low, “especially for grassy weeds like wild oats,” Ted says. The first year, he moldboard plowed the soil and planted wheat, barley, oats, and peas.

“I found a little patch of ground that had very little sod in which to plant the peas, mainly for seed production.” Because fertility in organic production relies much on organic matter degradation and microbial life, Ted does not want to plow deeper than 3.5 in.

“It’s hard to get rid of sod without plowing deeper,” he acknowledges, which is why he mostly transitioned to grains the first year.

Crop rotation

After his first year in organic production, Ted rotated to more spring peas and a couple acres of lentils.

“The market price is better for lentils, but I get more pounds per acre from peas,” he explains. Finding certified organic seed for the varieties he wanted proved challenging, but he was able to source conventional, non-treated foundation barley and oat seed from the University of Idaho. For peas, he started with the Columbia variety from Spokane Seed, but tried a winter pea variety in 2013 that he obtained from the Columbia Basin.

Ted also tried alternative crops.

“I grew yellow flax one year,” he says, with seed he obtained from Montana. Although the market was good, the yield was not satisfactory.

“I mainly wanted to raise seed stock, but I ended up putting some in my chicken feed,” he explains. He is considering growing camelina, which he has seed for, but hasn’t had time to experiment with.

Soil fertility management

Ted is concerned that the soil health of his fields was damaged by their conventional farming history.

“We used to have half of our acreage in grass production. We were using 150 lb of nitrogen per acre every year.”

He points at the detrimental effect of the repeated synthetic nitrogen addition.

“I pulled a soil sample from a patch that had not been farmed for 120 years, and the pH was at around 6.8.” He contrasts that with the results of 5.7 to 5.9 found on the rest of his farm.

“Rebalancing my soils will take time and money,” he acknowledges. He estimates it would cost him as much as \$200 per acre to “balance his soils to where they should be,” i.e., liming to correct acidity, increase nutrient availability, and supply certain nutrients.

“Weed control was the easy part,” says Ted. Soil fertility remains his primary challenge. He uses a two-year crop rotation, alternating legumes (Figure 7.1) and cereals, which help nitrogen levels.

“I got a 40-bushel (spring) wheat yield using only rotation as fertilization.” After talking to other organic growers in Oregon, Ted thought he would make compost tea to apply to his fields, but did not find the time to do it. Other ideas included using fish fertilizer. Instead, he found that green peas grown as a cover crop could add as much as 150 to 200 lb of nitrogen per acre. For the first time, last fall he planted a pea cover crop. He plans to work it in early in the spring before planting a spring cereal. With 25 in. of annual precipitation, Ted has enough moisture for this cover cropping system, but it can delay his spring planting, which is why he is looking into alternative solutions.



Figure 7.1. Ted Lacy uses spring peas in a two-year rotation to provide nitrogen for his cereal crop. (Photo by Diana Roberts, WSU Extension.)

He tests his soils with Kinsey Agricultural Services because “they have experience with organic farms and provided advice to rebalance my soils,” he says. Aside from nitrogen supply and a slight sulfur deficiency, Ted has no other nutrient shortages on his farm.

“It’s all about availability. I have plenty of phosphorus in my soil, but it is all bound up and not readily available for the crop,” he explains.

Weed and pest management

The weed pressure was relatively low when he got out of CRP, so Ted did not see the need to delay planting to wait for a few flushes of weeds to emerge. The approach was a success; seeding early provided his crop a competitive edge, which kept weed pressure low. Additionally, he accumulated enough sections of rotary hoe to make a 50-ft unit for in-crop weed control (Figure 7.2).

“I run it backwards, so the tines knead instead of digging the ground, as that causes too much soil disturbance,” he says.

He rotary hoes about three times (Figure 7.3), spacing the trips about one week apart to allow new flushes of weeds to emerge.

“Timing and soil moisture are critical,” he explains. “You want to rotary hoe right when the weeds are so tiny you can barely see them. If you wait until they are larger to hoe, you are too late.”

He starts scouting his fields 10 days after seeding to plan for the first pass with the hoe.



Figure 7.2. Ted Lacy's 50-ft rotary hoe consists of several units joined together. (Photo by Diana Roberts, WSU Extension.)



Figure 7.3. The rotary hoe achieves good weed management with proper timing. (Photo by Diana Roberts, WSU Extension.)

The tool has two functions: it mechanically kills emerged weeds and produces a fine dust mulch on top of the surface.

Ted explains the care that needs to be taken when using the rotary hoe in-crop. "Do not go parallel to the row, or you will tear up your crop," he insists.

Instead, he goes diagonal to the rows and takes extreme care when turning. "It can also pick up small rocks and tear the crop out, so you have to watch out as you go," he adds (Figure 7.4). He goes at a speed of 5 to 6 mph and a depth of approximately 2 in.



Figure 7.4. Ted Lacy demonstrates the flicking action of the rotary hoe in removing weed seedlings. (Photo by Diana Roberts, WSU Extension.)

With peas, Ted normally makes one or two passes instead of three as the rotary hoe tends to tear out the peas as they get a little bigger in size. He compensates for additional weed control by planting on 3.5 in. centers instead of the traditional spacing of 6 or 7 in. The canopy closes so fast that it suppresses the weeds that may try to emerge after he is done rotary hoeing. He also uses heavy seeding rates, 180 lb/acre for spring wheat and 320 lb/acre for peas. He scalps his entire crop before selling it to clean out weed seeds.

Ted's organic weed management tools include:

- **Early planting date;**
- **Early scouting for weeds;**
- **Rotary hoe, run backward and diagonal across rows (provides mechanical control and a dust mulch);**
- **Heavy seeding rate; and**
- **Competitive crops (peas).**

Managing Canada thistle is Ted's biggest challenge when it comes to weed management. He built a sweep (undercutter) using a plow frame and sweep blades specifically to address that issue. For the first time since he started his organic production, Ted put some of his acreage in summer fallow in 2013. He used his sweep repeatedly on the fallow ground, trying to average a 12-in. depth, but going sometimes as deep as 18 in. to exhaust the thistle's root system. "I'm hoping to get around 75 percent control from doing this."

He followed the summer fallow with winter peas, hoping their competitiveness would help choke some of the thistle. He also found quackgrass, another perennial weed, but he expects the sweep to take care of it.

Ted does not mention disease problems in his crops, but acknowledges insects can cause some limited damage. After harvest, he scalps his peas and stores them in a tank with diatomaceous earth mixed in, which prevents weevils from eating the center of the peas.

"One advantage of being in the feed business is that blemishes or mild pest damage are not a big deal," he says. "A few bugs just increase the protein content, if anything!"

He also notes that he hasn't had any lygus bug problems in his lentils, which puzzles him, as they were present when he was farming conventionally. "It could be due to the rotation, or simply because my lentils are healthier," he notes.

Marketing and certification

Ted does not contract any of his production, but does not sell everything immediately either. Having on-farm storage allows him to hold on to his crop.

"You can't just haul it to the elevator," he points out. Because of his small volume, he sometimes has to mingle product from previous years in the same bin, which is frowned upon by the organic certification inspectors.

"The certification process can be a hassle," he admits. He estimates he spends at least four hours a year going through inspection, which does not count the time he spends record keeping.

Currently, he is inspected by Nature International Certification Services, a certification agency from Wisconsin. They have been very good to work with, and the inspector they have hired is helpful and willing to provide information up front to prevent trouble.

Benefits and challenges

A personal benefit Ted sees in farming organically is not working with chemicals. He is more cautious in describing soil benefits, although he does observe more earthworms in his fields now, compared to what he had when farming conventionally. He is also happy to see the quality of his production. For example, a local buyer has been very satisfied with his hay. She says her animals performed better on it and attributes the high pork quality she obtained to Ted's production practices.

"I get more satisfaction farming organically than I ever did when I was in conventional," Ted concludes. "I see no reason to go back."

Future plans and advice to other growers

Ted enjoys the challenges associated with organic production and doesn't envision going back to farming conventionally, "more for philosophical reasons than economical ones." Some of the plans he has for his operation include rebalancing his soils and experimenting with different cover crops.

"I could sell ten times what I raise," says Ted. But he insists on not expanding his acreage too fast. His advice to growers interested in organic production is to start small and slow to minimize financial risk.

"It can be a burden to have to clean equipment between fields if most of the rest of your farm is conventional, and the learning curve is a steep one," he warns.

His small-scale operation presents some disadvantages. One is that he does not offer the volume many buyers require to make a transaction.

"I have potential buyers calling, sometimes even from back East, but they would like a whole semi load. I don't have that kind of volume, especially if I have anything in summer fallow," he explains. One solution would be to partner with other growers to send bigger shipments, but no one else farms organically nearby.

He also considered buying grain from other growers to process for chicken feed (Ted was the only certified processor in Idaho for some time.), but he lacked time to pursue that project. "Right now, my volume is so small that it is not worth it for me to have a processor license," he adds.

What does the law say?

Organic producer versus handler: When is an organic processor certification required?

Farmers who produce organic crops are certified as producers. They may sell their certified organic raw goods directly to consumers under a producer certification. If they process their crop before selling it, they need an organic handler certificate. For instance, combining pea and small grains to produce organic chicken feed is considered processing, which is why Ted Lacy had to obtain an organic processor, or handler, certificate.

You can find a Guide for Organic Processors [here](#).

8. Sam and Brooke Lucy, Bluebird Grain Farms, Winthrop, Washington

Location: Okanogan County, Washington

Annual precipitation: 16 to 18 in.

Irrigation: Supplemental

Dominant soil types: Owhi ashy fine sandy loam; Muckamuck silt loam

Crop rotation: Green manure (cover crop)—spring emmer wheat—spring emmer wheat

Sam and Brooke Lucy are owner-operators of Bluebird Grain Farms located near Winthrop, Washington, in the Methow Valley. They grow, process, and direct market heirloom grains, primarily emmer wheat (*Triticum dicoccum*, see [sidebar](#) in Brad Bailie’s case study for a description of heirloom grains).

Getting started

Sam sees an increasing market for organic grain fueled by consumer concern over genetically modified organism (GMO) issues. He believes also that non-GMO crops will be as important as organic food to many consumers.

Sam does the farming and Brooke runs the product development and sales. Sam considers their value-added marketing to be more work than the farming, but he attributes their success to this aspect of their enterprise (Figure 8.1).

Sam has always farmed organically. Originally from New Hampshire, he ran a dairy there. On moving west, he worked for an organic farmer before going out on his own. He leases all his land (about 250 acres). Much of the ground had been uncultivated for 30 years and was full of “old-growth quackgrass,” which he tilled out prior to seeding a crop.

“I love the land, and that’s why I’m here,” says Sam. “I feel the grain we grow is nutritious. We can make a living and feel good about what we do.”

The farm has been certified organic since 1999. Initially they shipped their organic barley to western Washington. The Lucys started Bluebird Farms and their processing plant in 2004.



Figure 8.1. Brooke Lucy (right) is the product development manager for Bluebird Grain Farms, while Sam Lucy (left) does the farming. (Photo by Diana Roberts, WSU Extension.)

Sam believes that growing a specialty grain, and then selling a value-added, finished product is the only way they can make it as small-scale farmers (Figure 8.1).

Crop rotation

A typical three-year rotation for Sam is green manure (cover crop) for one year followed with a spring grain, and emmer wheat, usually, the next two years. The legume green manure provides most of his soil nitrogen.

For the first time, in 2013, Sam tried Austrian winter pea as a cover crop, which he seeded on October 1 for incorporation in the spring. He has used AC Greenfix, which is a variety of chickling vetch (*Lathyrus sativus*) that is drought tolerant and adapted to many regions. He flailed and turned it in at flowering. Other cover crops he’s grown include fall rye and red clover (seeded at 5 lb/acre). Some years the red clover doesn’t winter kill, which is problematic.

Sam seldom includes alfalfa in the rotation, as his marketing program focuses on wheat and he doesn’t have enough ground for long rotations.

“Alfalfa can be useful to clean up (weedy) fields, but it’s water and labor intensive to grow. It also sucks potassium from the soil. So it’s useful in the rotation, but probably the reason we have potassium deficiencies is because there has been so much alfalfa grown in this valley,” he says.

Sam maintains that rotating crops is good, but you can get nutrient deficiencies that you then have to fix with the next crop.

The best emmer crop (80 bushels/acre) that Sam raised (Figure 8.2) was following the AC Greenfix. The emmer was seeded on June 4th that year. Because harvest was later than normal, Sam invested in a grain dryer. Rain at harvest, he finds, may discolor the grain, but has not affected the flour quality.

Soil fertility management

The soil on Sam's farm is clay loam with a high pH. Some of his fields have issues with high magnesium levels.

"Magnesium tends to tie up potassium, and alfalfa robs the soil of potassium," says Sam. He adds potassium (and lowers magnesium activity) with Super S Potash. Potash is a volcanic mineral that is mined in Nevada and certified for organic producers.

Contrary to conventional thinking, Sam does not prioritize nitrogen in his soil health plan. His goal is to have a balanced nutrient profile with adequate trace minerals. Consequently, he is comfortable with his soil nitrogen levels being about 20 percent what they would be in a conventional system. He does apply foliar nitrogen during the crop growth. If using fish-based foliar fertilizer, Sam applies it early at about the two- to three-leaf stage. With other products the timing is variable, but beyond the flag-leaf stage, the crop would not absorb it as well.



Figure 8.2. Sam Lucy inspects a crop of organic emmer wheat growing on his farm in the Methow Valley of Washington. (Photo by Diana Roberts, WSU Extension.)

On his farm, trace minerals such as boron and zinc tend to be limiting factors. "They are important and this valley is starved for them," he says. "It's also important to have the fertilizer [formulation] work with your equipment."

Minerals may also be applied in a foliar manner, though care must be taken not to burn the plants with over-concentrated solutions. Sam tried a B17 (boron) product that orchardists apply through drip irrigation, but it didn't dissolve adequately for his system. Solubor (borax) was easier to use, but tough for Sam to source. There are no soil consultants in the region so he works with organic orchard consultants to find the product he needs.

"I haven't figured it out yet," he says. "But we're definitely deficient in these nutrients."

Sam Lucy's soil fertility goal is to achieve a balanced soil profile with adequate trace minerals.

Sam has also used enzyme products (straw digesters) from Tainio Technology, based in Cheney, Washington. "It takes a lot of carbon and nitrogen [for microbes] to break down straw, and I want to be adding to my soil, not removing nutrients."

The number of commercial products available for organic systems has increased over the years, which Sam says is good and bad, as a farmer has to sort through what will work. Nowadays his primary advisor is Phil Wheeler from Crop Services International in Grand Rapids, Michigan.

When asked what changes he's seen in the soils on his farm, Sam replies, "I don't know the soil that well. Twelve years is not a long time. It's made some gains and I've increased the availability of minerals. That is more important than the total content [of nitrogen, phosphorus, and potassium]. I grow nutritious crops. Ideally I should grow what the soil needs [as a green manure]."

Weed and pest management

Typically, Sam seeds his spring crops starting early in May up until June 1st. On occasion, weather permitting, he has delayed seeding until June 10th. Late planting enables him to manage weeds with cultivation beforehand. "If you're relying on steel for weed control, you have to let as many weed seeds as possible germinate [before you plant]," he offers.

Weeds are a problem primarily in fields that are new leases for Sam. He runs an offset disk cultivator and culti-packer across the fields to manage weeds and prepare the seedbed. He uses a moldboard plow only to kill grass or take out alfalfa. Sam will use a sweep (undercutter) prior to seeding, but he does no post-emergent, in-crop tillage.

“I need a walking beam cultivator so [the sweep] floats better and maintains a constant depth. It has three lines of sweep with tines in the rear,” he explains. “The timing of these operations is critical,” adds Sam.

The number of cultivations he utilizes is dependent on the weather, but he does at least two cultivation operations prior to seeding.

“I’ll do one early, and repeat it two weeks later, if I get rain,” he emphasizes.

For seeding, Sam uses a disk drill set at 7.5-in. spacing, and typically he plants at a depth of 3 in. so the seed contacts deep moisture that lies below a dust mulch he created with tillage.

“This way the grain will grow, but not the weeds,” advises Sam. The drill also has tubes at the back, which Sam uses for broadcasting small-seeded clover as green manure. Packer wheels behind the drill firm the seedbed and press the seed into the ground.

Sam can irrigate his crops with water from the Methow River (Figure 8.3) or his one well to aid growth through the hot, dry months. He never applies more than 12 in. a year. Though in 2014, the spring was so dry he had to irrigate some fields to enable the crop to get out of the ground.

Sam has not experienced many problems with insects or disease in his crops. He believes that having a better-balanced soil helps him grow healthy plants.

Sam also uses the harvesting process to manage weeds, harvesting the weed seeds with the grain and cleaning it afterward.

“Gotta love the rotary combine. It will thresh anything,” he says.

Common lambsquarters is the primary weed he deals with. Its seed holds a lot of water so it could be a problem in storage. Sam cleans his grain before storing it, and he feeds the weed seed to his chickens and nearby deer. Two of his grain tanks have a Rocket Aeration System, but as a precaution, he rotates grain among his storage bins to prevent moisture buildup.



Figure 8.3. The Methow River is a source of irrigation water for local farmers, though agricultural acres are declining in the area. The scenic Methow Valley is an increasingly popular destination for mountain biking and Nordic skiing. (Photo by Diana Roberts, WSU Extension.)

“Lambsquarters is benign compared to whitetop. Don’t know what to do with that....” ponders Sam. “I’ve used vinegar when it’s young and it knocks it back, but not completely.”

Canada thistle can be a problem.

“After the last round of irrigation I dig it with a hand shovel and leave it lying there [in the field]. It’s mined up nutrients and I believe if I put it back in the soil it will improve it. But probably I won’t see this in my lifetime,” he adds.

Marketing and certification

Bluebird Farms cleans, processes, and packages their emmer wheat (known as farro in Italy) as whole grain or flour in a variety of bag sizes. They also operate a CSA (Community Supported Agriculture) program. Their market remained consistent through the recent recession. At this time, they sell to 10 distributors and are considering marketing via a national, organic distributor.

Another option the Lucy’s are considering is becoming grain brokers (in addition to or instead of farming). This expansion, however, would require them to invest in a bigger facility and more processing equipment, and possibly work with other farmers to accomplish their goals.

The thought of making more money is attractive, along with being able to pay their employees higher wages. But Sam asks himself whether this would be worth the extra investment?

“I know now why people don’t do production and processing,” he says. “We get to visit the fields every week it’s growing [but the additional work is huge].”

Sam Lucy attributes the success of their farm business to the value-added enterprise run by his wife, Brooke.

Sam's advice to growers considering organic production is to experiment with their best ground rather than their worst ground.

Sam feels some frustration with the organic certification process; the certifier (the Washington State Department of Agriculture) seldom visits his farm and is not a resource for his agronomy concerns.

"It's a punch to have to pay more to grow crops without chemicals," remarks Sam. "And the more we make, the more we pay."

"It's not really a program, but pencil pushing," he says. He feels that weakens the validity of the certification, but adds, "I would be a nightmare as an inspector."

"We need to look at [organic farming] completely different. Think deeply about what this plant really likes to be happy. It's a lot more than stopping chemical inputs. We've got to go back to growing food [rather than producing a commodity]," Sam emphasizes.

"A big mistake is to take your worst ground and put it in organic. Use your best ground!" he concludes.

Advice to other growers

Sam's best advice for a grower new to organics is, "Think why you're doing it! If for the marketplace only, don't change. Big organic [farms] will decrease the margin, but organic farmers still will have fewer inputs. Don't do it only for the money."

What does the law say?

How can you be sure a product is approved for use in organic production?

Sam Lucy raises an interesting point when he talks about the constant stream of new products available for organic producers. The complete list of authorized synthetic substances for organic production can be found in the Electronic Code of the National Organic Program, § 205.601, but the list only uses the generic terms for the substances (not brand names). Some new products can contain an allowed substance as an active ingredient, but might contain prohibited substances as inert ingredients. To avoid the risk of applying a prohibited substance and losing your organic certification, always verify that the entire product is allowed for organic production. The Organic Materials Review Institute (OMRI) and the Washington State Department of Agriculture (WSDA) both review all ingredients in commercialized products to determine if they are allowed in organic production. Be sure to check the most recent version of the list. Be aware also that some products are allowed in organic production, but their manufacturers have chosen to not list them with either organization.

You can find the OMRI list [here](#) and the WSDA list [here](#).

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

9. Lou and Teresa Anderson, Lou and Teresa Anderson Ranches, Fairfield, Idaho

Location: Camas County, Idaho

Annual precipitation: 17 in.

Irrigation: Primary irrigation from wells, using circles

Dominant soil type: Brinegar loam

Crop rotation: Alfalfa 7 to 9 years followed by spring barley 2 to 3 years

Lou and Teresa Anderson run a diversified hay/grain/cattle operation at Fairfield, Idaho. Their land sits on a high plain at 5,000 ft above sea level, located south of the Sawtooth National Forest (Figure 9.1). Winters there are cold and snowy, while summers are hot and dry.

The Andersons produce organic alfalfa and barley on 6,500 acres in the area. They also run 600 cows on pasture that is not organic. Teresa helps out in the field whenever needed, and they hire six to eight helpers in the summer.

The topsoil (decomposed granite) on their farm is underlaid with clay that prevents water infiltration, thus creating a “perched” water table. “The water that runs off the mountains sits within two feet of the surface all summer. It’s usually good for dryland alfalfa, when we had a normal snowpack,” says Lou. For the last 25 years however, the water table has gone down below the root level for most of the summer.



Figure 9.1. The Sawtooth Mountains of Idaho are aptly named. (Photo by Diana Roberts, WSU Extension.)



Figure 9.2. Due to a drought cycle in Camas County that has reduced runoff from the mountains, farmers are more dependent on irrigation from groundwater. (Photo by Diana Roberts, WSU Extension.)

While dryland farming in the area used to be more profitable than irrigated (due to the increased input cost of applying water), the region has been in a drought cycle with little winter precipitation. Lou now relies on irrigation to produce his crops. Fortunately he has wells and groundwater rights that date from the 1960s and 70s, when new water rights were last available. Using circle systems (Figure 9.2), he is able to irrigate about 700 acres (about 10 percent of his ground). Nowadays the irrigated land is much more profitable than the dryland acreage.

Getting started

Initially, increased profit potential was the incentive for Lou to obtain the Certified Organic label. He adds, “I’m not a big pesticide supporter, and I like not affecting the environment with contamination.”

In Camas County, growers are organic by default (because the short growing season does not allow for crop yields that make high inputs cost-effective). Lou first grew organic wheat in 1984, and by 1990 he was producing organic alfalfa and starting into organic barley because in his area, barley performs better than wheat. Feed barley is a lot easier to market than wheat because it has a ready market and fewer quality constraints than wheat. Most of the dryland acres were being farmed in an organic manner for years before certification was available, and consequently, an organic dairy was established in Burley, Idaho, to take advantage of the immediate supply of dairy feed.

Lou isn't too concerned about the debate over organic food being healthier. But he does believe organic foods should be more affordable, to enable growth in the market. Lou thinks that the market for "organic purist consumers" is becoming saturated and he was discouraged that organic dairies grew only 1 to 2 percent in 2013 versus 15 to 20 percent annual growth previously.

Crop rotation

Typically, Lou grows alfalfa hay for seven to nine years, though he has kept fields in for a maximum of 20 years. He gets one, sometimes two cuttings per season. "The hay is low protein, but very palatable," he says.

The density of bulbous bluegrass weed in the fields determines when the crop must come out. He then follows the alfalfa with spring barley for two or three years.

Soil fertility management

Lou believes that with their low yields and long crop rotation (roughly 12 years with 75 percent in a perennial legume that adds nitrogen), they are removing little fertility from the soil. They tried applying compost in strips for five years, but couldn't see a difference. Barley (yielding 10 to 30 bushels/acre) is in the rotation only two or three years, and tests indicate that the soils are holding their own. He adds, "There have been some new test plots that are showing some promise for compost use, as well as organic biological products that have shown potential for the irrigated acres."

Lou Anderson leaves stubble from the previous crop standing over winter in order to catch as much moisture (snow) as possible.

Weed and pest management

Lou uses a minimum tillage system to reduce the number of passes over his ground. He starts the season by leaving stubble from the previous crop standing over the winter "because it catches more snow," he says.

In the spring he disks the ground once to incorporate the stubble and manage weeds. He then seeds using a disk drill that runs a roller harrow in front.

"The harrow gives me a second shot at the weeds, plus it incorporates more stubble," says Lou.

A press wheel behind the drill packs in the seed row and makes the seedbed firm and smooth. A major challenge for the Andersons is bulbous bluegrass in their alfalfa hay. They use a moldboard plow to take out the alfalfa in order to bury the weed seeds as deep as possible.

While every farm soil is unique, data from Koenig et al., 2009, shows that alfalfa hay may remove substantial levels of nutrients from the soil, depending on the tonnage of hay harvested per acre (Table 9.1).

Lou Anderson indicates he was using routine soil tests to track his soil nutrients, which is the university recommendation. Nutrient analysis of the hay helps provide a complete picture of the nutrients available in the soil and removed by the crop.

Table 9.1. Average tissue nutrient contents and their removal in alfalfa hay production.*

Nutrient	Nutrient concentration in early bloom hay (dry matter basis)	Nutrients removed (lb per ton) with early bloom alfalfa hay (analysis from previous column, 88% dry matter)	Range of nutrients removed (lb per ton) of hay at 88% dry matter
Nitrogen (N)	19.9% crude protein (3% N)	56 N	50-70 N
Phosphorus (P)	0.2% P	8 P ₂ O ₅	8-16 P ₂ O ₅
Potassium (K)	2.6% K	54 K ₂ O	48-72 K ₂ O
Sulfur (S)	0.3% S	5 S	4-6 S
Calcium (Ca)	1.6% Ca	30 Ca	28-35 Ca
Magnesium (Mg)	0.3% Mg	6 Mg	5-8 Mg
Boron (B)	—	—	0.05 B
Zinc (Zn)	30 ppm Zn	0.05 Zn	0.05 Zn
Copper (Cu)	12.7 ppm Cu	0.02 Cu	0.02 Cu
Molybdenum (Mb)	0.29 ppm Mo	0.0005 Mo	0.0005 Mo

*Reproduced from Koenig et al., 2009, p. 2.

New seedlings of alfalfa often have lots of weeds; Lou will swath the field in the fall, then rake, bale, and burn the weeds.

“If the infestation is too bad, some organic farmers will apply post-emergent herbicide to newly seeded alfalfa fields the following spring.” Although Lou never uses herbicides, he says, “Some farmers believe it’s easier and cheaper to manage this way and it gives the new alfalfa a better chance to establish, even though they lose two years of organic production.”

Field bindweed can also be problematic in the alfalfa. Some farmers in the area have tried growing Roundup Ready alfalfa and they have been successful managing the bindweed this way.

Lou says, “I have not planted GMO [genetically modified organism] seed. One problem with this practice, in an organic situation, is that the alfalfa crop can never be certified as organic because of the use of a GMO variety.”

Additionally, linnets (a bird in the finch family) in grain can be problematic in the maturing barley crop.

Marketing and certification

The Andersons sell their barley to local dairies. Currently they ship their hay to Aurora Organic Dairies in Colorado and Texas. There is a big price increase if the hay reaches 15 to 16 percent protein. A small percentage of the hay goes to local dairies.

“Building trust with your buyer is important,” Lou emphasizes. Currently he is not involved in the pelletizing of hay for shipment, but there is another group trying to establish a business to ship to California.

Lou also works as a facilitator (Figure 9.3) for other organic growers who need help with marketing.

“Growers need confidence in getting their payment,” he says. Lou adds that people don’t “like” hay or grain brokers, so he emphasizes that he works as a sales “facilitator.”

Through his service, he enables the grower to sell to a dairy for a named price, but Lou charges the dairy a fixed price per ton for finding the hay and arranging freight, regardless of the price the grower receives.

The organic certification process has been “good, bad, and in between,” reports Lou. At this time he uses a California Certifier, but has a “good relationship with the Idaho Organic Department [the Idaho State Department of Agriculture Organic Program].”



Figure 9.3. Lou and Teresa Anderson of Fairfield, Idaho, combine farming with a marketing service for other growers. (Photo by Diana Roberts, WSU Extension.)

He noticed that the fee structure was pretty easy and informal initially, but over the last six to seven years it has become more complicated. In 2013, however, Lou had no problems and noticed “a new, kinder, gentler approach.”

He feels it would be helpful if the inspector would advise and show farmers how to set up their system so they could become successful without having issues in the future.

Benefits and challenges

Lou believes that overall he is more profitable with organic production. However, markets fluctuate and some years the conventional prices are so good, the incentive for organic isn’t there.

“This was the case from 2009 thru 2011,” says Lou. “There were a number of producers [in the area] that stopped producing organic feed, because the economic incentive was not there.”

This, along with production problems in our area, and the Midwest drought, caused a shortage of organic feed, and increased the organic price premium, says Lou. “Today organic dairy feed is trading at an attractive premium. Our biggest production problem is water [availability]. We like to think the average rainfall is 17 in., but this year [2013] we got 9 in. And frost—this year [2013] it froze repeatedly,” he adds.

“There’s not much we can do for moisture,” he continues. “We heavily stubble our fields to try to trap extra moisture over winter, so don’t do [any] fall disking.”

Lou emphasizes that farm businesses have to make a profit, so organic growers should be realistic about the situation and what they're willing to do to make it work.

Advice to other growers

When asked how he would advise a grower interested in trying organic farming, Lou says, “Look at the area you’re in. Can you overcome the challenges and still be profitable? Ag businesses have to make a profit. Be realistic about the situation and what you’re willing to do.”

What does the law say?

Genetically modified organisms and organic certification

The use of transgenic, that is genetically modified (GM), crops is prohibited in organic production. Alfalfa and canola are of specific concern in the Pacific Northwest region, as GM varieties are available for these two crops. If only part of your operation is under organic certification, pollen from GM crops grown on the conventional part of your farm might contaminate your organic crop. Contamination of the organic crop with GM pollen will result in the loss of organic certification. The USDA guide for Organic Crop Producers recommends to distance GM crops from organic crops based on seed production isolation distances to minimize risks of contamination.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

10. Brad Bailie, Lenwood Farms, Connell, Washington

Location: Franklin County, Washington

Annual precipitation: 7 to 10 in.

Irrigation: The entire farm is under pivot irrigation

Dominant soil type: Shano silt loam

Crop rotation: Variable. Ancient grain (emmer, einkorn or spelt)—cover crop (hairy vetch and triticale)—cash crop (onions, potatoes)

Brad Bailie farms 650 irrigated acres on land that has been in his family since 1915. His farm is located right outside the border of the Columbia River Basin irrigation project, so Brad pumps water from a deep water aquifer on his land.

The farm used to be in a dryland wheat–summer fallow system. His father started a small irrigation project by installing a well in 1969, but in the mid-1980s the whole farm was put into a Conservation Reserve Program (CRP) contract until 1999.

When the CRP contract began to expire, 50 acres were put into production and leased to an organic vegetable producer for a few years. Meanwhile, Brad farmed conventionally on rented land in the area. When his lessee quit farming, Brad stopped renting ground, went back to his family farm, and decided to keep farming it organically. He has been growing organic vegetables and small grains since 2003.

Getting started

In 2001, Brad spent a year in Guatemala working for Agros International, a non-profit organization that fosters community and agricultural development for poor rural families in Latin America. While there, he was promoting sustainable agricultural practices and appropriate technologies for the families' means and needs.

“For some reason, it made perfect sense for me to use organic there, but I did not have that in mind at all when I was back home.”

Brad explains that organic worked well in remote villages of Guatemala because it allowed them to produce with a relatively closed system including animals and using manure and compost to fertilize their crops.

“I was promoting something I was not practicing at home. When I came back to the United States, I was more open to organic because I had seen it working there.”

When Brad took over the family farm, the 50 acres in production were already certified organic. Although he had little experience with organic production, he decided to continue with that system.

“It was a double whammy; I was learning about vegetable production and organic production [at the same time],” says Brad, who notes he might have had a harder time switching to organic had he been producing vegetables conventionally first. “It was a steep learning curve the first few years, but I’m happy now that I did it.”

Brad took over the contracts that the previous farmer left behind and says it made it easier for him, being able to transition into an already existing system.

“I just had to improve that system and expand it,” he says.

For the most part, his farm was directly transitioned from CRP to organic. Only one small section of a field was farmed conventionally and had to go through a three-year transition period.

“I think we fallowed it, then grew a wheat crop, then a cover crop,” recalls Brad. Generally, his strategy was to grow a cover crop immediately after going out of CRP, and apply some compost or manure before getting into vegetable production.

Brad rents ground from his father, who purchased more water rights. Brad was able to drill a second well in 2007 and has now 650 acres under pivot irrigation (Figure 10.1). He has enough water to irrigate two circles (120 acres each) during the entire growing season.

“It’s a balancing act to figure out how many acres of each crop I can plant and how much I can take care of.”

Crop rotation

Due to limited water, Brad’s rotation changes to adapt to water availability and markets. He consistently grows about 120 acres of onions every year, but his ground allocation varies for other crops.

Although Brad grows mostly onions, peas (for freezing), and other vegetables (carrots for seed, butternut squash, and potatoes), small grains are important in his rotation because they require fewer inputs.



Figure 10.1. Brad Bailie stands on a center pivot platform to describe his farm during a field tour. (Photo by Diana Roberts, WSU Extension.)

All of Brad's land has water rights associated with it, but "I have more ground under pivots than I have water to irrigate it, so I plan my rotation accordingly so the watering needs don't overlap," explains Brad. For instance, early in the season when onions don't need much water, Brad can use his available water on his grains and cover crops. He will move the water to his onions or peas later in the season.

Brad grows emmer, einkorn (Figure 10.2), spelt, and black barley, which are ancient grains (see [sidebar](#)). "They work well in my rotation because they are fairly hardy and are good scavengers of moisture and nutrients," he says. They also work well with limited water. Too much water on emmer or einkorn can actually result in lodging. Brad admits lodging can be a challenge and says he wishes he could push the yields a little more, "but these varieties have never been improved. They can't have the same yield potential as modern wheat." Generally, Brad puts as much water as he can on his grains after the needs of his cash crops are fulfilled. "It's not very much," he says, "maybe 3 to 4 in. on einkorn and a little more on spelt," in addition to about 7 to 10 in. of precipitation.

In 2014, he was growing 90 acres of small grains, all planted in einkorn. He also would have had 40 acres of spelt, but the crop did not survive the winter so Brad replanted the ground to camelina.

Brad's cover crop serves a dual purpose, building soil nitrogen and competing against weeds.



Figure 10.2. Harvesting a crop of einkorn. (Photo by Brad Bailie.)

Soil fertility management

Brad was not completely surprised by the positive effect of organic practices on his farm. He thinks farming organically has been beneficial to his soil. He monitors his soil health carefully through regular soil tests.

The well water Brad uses to irrigate his farm has consequences on his soil.

"The pH after getting out of CRP was around neutral, but it has been increasing as I have been irrigating," explains Brad. The water, rich in sodium and calcium carbonate, is fairly alkaline.

After several years of irrigation, the pH in some of his ground approaches 8 to 8.5. The sodium in the water also causes crusting problems. Brad addresses these issues with cover crops, which help raise the organic matter content, and by applying gypsum. He is considering using a sulfur generator to lower his water pH; he thought about injecting it into the water, but would more likely apply it directly to the soil.

Brad relies on a cover crop to supply most of the nitrogen to his crops. He plants a mix of hairy vetch (a legume for nitrogen fixation) and triticale (a cereal for ground cover and weed competition) in the fall after grain harvest, then plows it under in June. After a short fallow period, he uses mustard as a cover crop before planting a cash crop like potatoes or onions the following spring.

"The ground can be 18 months total in a cover crop," notes Brad, with 10 months in nitrogen-fixating hairy vetch. "I use it to grow most of my nitrogen."



Figure 10.3. Using a spader (left) to incorporate a vetch-triticale cover crop and (right) a close-up view of the spades attached to a central rotor. (Photos by Brad Bailie (left) and Louise Lorent, WSU (right).)

Brad uses a spader to work in his cover crop, a PTO-powered tool consisting of metal spades affixed to a central rotor (Figure 10.3). The spades act as shovels in rotary motion. “It’s fairly aggressive; it can go 9 to 10 in. under,” he explains. But he says it’s less aggressive than a rototiller, as it moves deep but slower.

He supplements his soil nitrogen needs with raw chicken manure that he sources from a broiler farm located on the West Coast.

“I might put down one to two tons of manure per acre two to three years.”

Brad found that he does not need to put on as much nitrogen as his soil test levels suggest. “The test levels indicates that the nitrogen is low, but the crop looks fine,” he explains.

He thinks that organic practices preserve microbial life, which in turn can make nutrients more available even though the absolute levels are low. He also uses hydrolyzed fish emulsion as a fertilizer, and at times, another commercial organic fertilizer called Perfect Blend.

Brad’s cover crop precedes his cash crop like onions, carrots, or potatoes. Sometimes grains have enough residual nitrogen from his crop rotation. However, usually Brad will apply 1 to 1.5 tons of chicken manure before a grain crop. “A neighbor spreads it for me, or I borrow his spreader,” he explains. He has noticed that his organic matter content rises after a cover crop and declines after onions.

Weed and pest management

Weed management starts prior to planting. When possible, Brad uses timing as a weed-management strategy.

“I like to be able to have one flush of weeds early before planting in the spring. I can till them under and plant in a clean seedbed.”

If the spring is dry, he can plant the grain deep enough to reach moisture. He rotary hoes to create a dust mulch that prevents weed emergence, which allows the grain to get ahead of the weeds. He usually seeds anywhere from 1.5 to 2 in. deep.

“If it’s very dry, I will pre-irrigate to make sure I don’t have to plant [really] deep for the seed to reach moisture,” he explains.

Seedbed preparation is paramount for weed management later in the season.

“I know I will have to use a rotary hoe or harrow in the crop, so I make sure the seedbed is nice and smooth,” explains Brad, who uses a drill with tines to loosen compaction from the tractor, and a packer to level the ground.

Einkorn and emmer are spring grains. The timing of the growing season allows Brad to do a timely pass or two in the growing crop with a rotary hoe or harrow (Figure 10.4).

“I normally do that when the grain looks big enough to handle it and when the weeds are just coming up,” he says. Brad adds that he uses heavy seeding rates, as the ancient grains are not competitive crops. “Einkorn, for instance, is very spindly throughout its whole life,” he explains. Spelt has more aggressive growth, but it’s also a fall-seeded crop, which makes weed management more challenging as weeds have more time to become competitive.



Figure 10.4. Brad Bailie uses in-crop cultivation to manage weeds in his spring einkorn crop. (Photo by Louise Lorent, WSU.)

“Even if it looks like the weed population is at a level that won’t affect the crop yield-wise, I need to control weeds because they are next year’s weed seeds.” Brad says he strives to not let his weed seed bank build up. “The times I have let weeds go, I have paid for it in the following crop,” he adds.

Even if his grains do not bring a lot of cash, Brad decided it was worth hiring people to hand-weed his grains.

“I have higher-value crops following that are not very competitive. I end up recouping the cost of hand-weeding in these cash crops.”

Following a zero-tolerance policy for weeds setting seeds, Brad even manages weeds coming up after harvest, during fallow, and cultivates weeds out of his cover crops.

“Even if I have a fairly clean farm, more weeds keep being brought in by the wind: tumble mustard, Russian thistle, [and others].” He adds, “At least I have a clean source of water.”

Brad uses the following weed management tools on his farm:

- Delayed planting after a first flush of weeds;
- Creating a dust mulch;
- Preparing a seedbed that facilitates post-emergence tillage; and
- Hand-weeding to prevent weeds from setting seed.

Wireworms have not been a problem in the grains. “They are more of a concern in my vegetables, mostly because they can poke holes in the drip tape I use to irrigate onions,” explains Brad.

Brad has not had severe disease issues in his crops, although he has seen spots of rust in his spelt.

“I don’t water enough to promote diseases,” he says.

For the most part, diseases have been manageable. He is careful and takes a whole systems approach to pest management. For instance, pink root is an onion disease hosted by grains, which limits Brad in the amount of grains he can put in his rotation.

“In organic farming, you always have to think several years ahead. Every decision that I make for weed or disease control can have big, long-term consequences,” he concludes. He also planted insectaries (Figure 10.5) in several parts of his farm, especially in the corners of his pivots. The areas of flowering plants provide habitat for beneficial predatory insects.



Figure 10.5. Brad Bailie establishes insectaries to provide habitat for beneficial insects (left) in the corners of center pivot fields and (right) in center pivot roads of onion fields. (Photos by Brad Bailie.)

Marketing and certification

All of his emmer, einkorn, and spelt are grown for a company specialized in ancient grains.

“I can’t produce enough for the market,” says Brad.

Because he needs to hold back seed after harvest to plant the next year, his production cannot expand very fast. “These grains might only have a tenfold increase, as opposed to a 40 or 50, maybe 100-fold increase in modern wheat,” he explains.

Ancient grains are harvested in the hull, and then cleaned by his contractor. Brad cannot tell exactly what yields he gets. He thinks it hovers around 20 to 25 bushels/acre. The spelt yields better than that, while the emmer and einkorn are lower yielding. When it comes to the certification process, Brad says the inspection turns out to be more of an auditing process.

“If a person has a good record keeping system in place, it’s not that bad.”

Benefits and challenges

At this point, Brad says he could not imagine going back to conventional farming. Although the premium he gets for his production and the advantage in the marketplace are the reasons he stays in business, he says it’s just become a way of life.

“I got used to not using synthetic pesticides and fertilizers.” He feels what he does improves overall soil health and quality, “of course to the point that I can control it,” he says, adding that he cannot change his water source.

Brad says that because mistakes can have such long-term consequences in organic systems, one needs to be particularly attentive and persistent in the learning process. Long-term impacts can make organic farming less forgiving than conventional systems.

“I have the advantage of having managed this land long enough that I have quite a bit of control on the decisions I make,” says Brad, who recognizes farming on rented ground can be challenging. But “organic can also be more forgiving of mistakes or unfavorable conditions.” He thinks the improved soil microbial life can supply more nutrients to the crop, making them more resistant to disease, for instance.

Brad educated himself about organic production by attending grower meetings and interacting with other growers. He firmly believes in the importance of sharing his knowledge and experience with others.

“When I became an organic farmer, that’s what I got passionate about,” he says. He has been visiting many other organic farmers’ operations and says that they are always open to share their experience. He is involved regularly in educational tours and insists it’s a win-win for him to share his knowledge with others.

Future plans and advice to other growers

He advises growers interested in organic farming to be persistent and patient. “You need to pay attention to detail, like any farmer. You need to know life cycles of weeds [in order] to kill them, which insects and at what life stage you need to worry about them.... Having a general knowledge of your system takes time and patience.” Attention to detail is important for the certification process as well.

Specialty grains

Einkorn wheat (*Triticum monococcum*), **emmer** wheat (*Triticum dicoccum*), and **spelt** (*Triticum spelta*) are considered “ancient grains.” According to archaeology, they were cultivated in the “fertile crescent” region of the Middle East several thousand years BCE. All three species are hulled wheats, i.e., the glume remains attached to the kernel during harvest. They tend to be hardier to grow, tolerating drought or saline soils better than traditional wheat varieties. They are used for human food products, usually in a specialty market. In Italy, these species are loosely referred to as “farro.”

Kamut is a variety of Khorasan wheat or Oriental wheat (*Triticum turanicum*) that is owned by the Kamut Khorasan Company based in Montana. The company specifies that it be grown organically. The grain is hull-less and has multiple food uses. Also an ancient grain, kamut possesses favorable quality and nutrient profiles compared to traditional wheat. While it is not tolerated by people with celiac disease, it may be less irritating to those with wheat allergies.

Triticale (*x Triticosecale*) was derived as a hybrid between wheat (*Triticum aestivum*) and rye (*Secale cereale*). Typically, triticale varieties combine the yield potential of wheat with the hardiness of rye (including tolerance to disease and environmental conditions such as acid soil). While the crop holds potential for human food, at this time it is grown primarily as a feed grain.

What does the law say?

Using synthetic substances on certified organic land

Some synthetic substances may be used in organic crop production, under the condition that they do not contaminate crops, soil, or water. Substances used as pesticides may only be used if other methods (cultural, mechanical, biological, etc.) have failed to control the targeted pest. Elemental sulfur is listed as an example. It may be used as an insecticide, a plant disease control agent, or a plant or soil amendment. The complete list of authorized synthetic substances for organic production can be found in the Electronic Code of the National Organic Program, § 205.601.

Insectaries

Although there are no specific requirements to preserve biodiversity, the National Organic Program standards encourage growers to develop diverse systems on their farm. The law actually defines organic production as a “production system that is managed by . . . practices that . . . conserve biodiversity.” Maintaining biodiversity can benefit organic farms by developing populations of predators of crop pests. Brad Bailie plants and maintains insectaries, areas on the edge of his field that provide habitat to beneficial, predatory species of insects. § 205.206 of the National Organic Program encourages such prevention measures against pests.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

11. John Saili and Bryan Wood, Dry Creek Farms, Carey, Idaho

Location: Blaine County, Idaho

Annual precipitation: 16 in.

Irrigation: Center pivot and wheel lines

Dominant soil type: Little Wood gravelly loam

Crop rotation: Alfalfa 7 years followed by spring wheat 2 to 3 years

John Saili and Bryan Wood farm together on land belonging to John's uncle, Larry Peterson. The farm is in Blaine County, Idaho, which is a high altitude (5,000 ft) farming area south of the Sawtooth Mountains. Currently, they farm about 200 acres of the 1,400-acre farm organically.

The general soil type on their farm is clay loam with a high alkaline pH. They have used humic acid (unsuccessfully) to try to reduce the alkalinity. Although the average precipitation is 16 in. annually, in 2013 they received only 7 in. all season and only three-quarters of an inch during the summer.

Getting started

Bryan and John started farming together in 2005. Crop yields in Blaine County are limited due to the short growing season in the area (USDA agronomic zone 4b to 5b), so growers there farm organically "by default." Some have obtained organic certification in order to increase their revenue stream through organic premiums on their product. John and Bryan cite concern about genetically modified organisms (GMO) as part of their reason for organic production.

They have obtained soil information from Soils Alive, Inc., and from Gary Zimmer with Midwestern BioAg. Locally, they feel that organic production is falling out of favor and farmers are moving away from it.

Crop rotation

Bryan and John use alfalfa in their crop rotation (Figure 11.1) to build up nutrients. They can keep alfalfa in the ground for around seven years and typically harvest 5.5 ton/acre over three cuttings (with irrigation that they apply through a center pivot system or via wheel lines). They follow the alfalfa for two to three years with spring grain, usually spring wheat.



Figure 11.1. Bryan Wood (left) and John Saili grow alfalfa to build soil nutrients in their organic ground. (Photo by Diana Roberts, WSU Extension.)

Typically they grow the Alturas or Alpowa varieties, which are both soft white spring wheat. Black blight can be a problem in spring barley grown in their area.

They have grown spring barley, and obtained 110 bushels/acre the first year. But yields fell in subsequent years so they need a good premium to make staying in organic production worthwhile.

Soil fertility management

Bryan and John use alfalfa, a legume crop with the ability to "fix" atmospheric nitrogen, in their rotation as the primary means of adding nitrogen to their soil.

They have applied composted manure experimentally. Southern Idaho has many feedlots and dairies in the Magic Valley (60 to 70 miles away) so there is a lot of manure around. Their manure source had been turned three to four times so they considered it partially composted (seven turnings is needed for complete composting). They applied 3 to 4 ton/acre and it cost \$21/ton (delivery and application). They didn't see an improvement in their crop the first year after application, which made them uncertain of the overall benefit.

The pair has also tried applying a fish-derived slurry to their alfalfa. A rate of 20 gal/acre provided 11 lb nitrogen/acre. However, they had to filter it three times before putting it in their sprayer. "It's made from fish bones, and it STINKS!" they add.

Weed and pest management

In the fall, prior to seeding spring grains, they allow the fields to green up with weeds and volunteer, and then they plow to control weeds. The following spring they wait until the weeds have germinated, and then cross-drill as they seed.

This means sowing a half rate of seed at right angles so there is less room for weeds to grow. However, now they maintain this method is not effective and the cost of diesel “kicks our butt, especially if the organic premium is not enough.”

Bryan and John have used cross-seeding at half rates to increase ground cover and crop competition with weeds, but the increased fuel cost is not economical when organic premiums are low.

Marketing and certification

John and Bryan sold organic malt barley (Figure 11.2) to Anheuser Busch in the past, but the \$4/bushel premium was insufficient. That market went away three years ago. They have worked with Lou Anderson (see [Lou Anderson's case study](#)), a grower in the area who also acts as a facilitator for farmers seeking marketing opportunities. In September 2013 they were concerned about being able to market their crops and whether organic production was viable for them.

They liked the idea of working with other growers to market crops or fill orders, as it would provide a sale guarantee, rather than “playing the markets.”



Figure 11.2. Bryan Wood inspects an organic barley crop. (Photo by Lauren Hunter, UI Extension.)

Bryan and John said that in previous years organic certification was “more hassle than it was worth.” Four years ago they nearly quit the program for this reason. However, the program has improved and they felt that the current agents (with the Idaho State Department of Agriculture) were more realistic. “We’ve learned to carry notebooks [while doing field work],” John adds.

Benefits and challenges

John cites being knowledgeable about his soil types and characteristics ahead of time as a benefit when going into organic farming.

Like many farmers (both organic and conventional), John and Bryan say weeds are their greatest production problem. Also, trying to take out their alfalfa fields without using herbicides (Figure 11.3) can be problematic for the following barley crop. Sometimes volunteer alfalfa in the field is green when they are trying to harvest the barley, causing problems with the combine harvester.

They had a situation where they plowed out the alfalfa and disced the field six times the following spring, but still the alfalfa came back. The barley was 18 in. tall but still couldn’t outcompete the alfalfa. They ended up having to spray it out (and lost organic certification in the process).

Canada thistle can also be a problem. In the fall they use duck sweeps set at an angle to cut the thistle stems below ground. They follow up with disking in the spring.

Advice for other growers

Bryan and John advised anyone interested in organic farming to “take it in small steps.”

“That way if you have hard lessons early on, they will be on a small scale,” John says. “You will mess up with fertilizer.”

Bryan and John advised farmers to start organic farming on a small scale to minimize the cost of mistakes.



Figure 11.3. Plowing out organic alfalfa fields in Blaine County, Idaho. (Photo by John Saili.)

What does the law say?

Producing certified organic alongside conventional crops

“Parallel operations,” i.e., farms that raise the same crop organically and conventionally, must take precautions to prevent their organic crop from being contaminated by prohibited materials. Drills must be cleaned after seeding fungicide-treated seed before being used to plant organic crops, for instance. Farmers must maintain a border wide enough around an organic field to prevent pesticide drift. There is no minimum buffer, but it must be large enough to effectively prevent drift. At harvest, farmers must establish procedures to make sure organic and conventional products do not co-mingle. The same holds true for transportation, storage, use of equipment to apply fertilizer, etc.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

12. William Simon (Simon Farms) and Matt McLam (McLam Farms), Fairfield, Idaho

Location: Camas County, Idaho

Annual precipitation: 13 to 14 in.

Irrigation: Dryland, plus some irrigation

Dominant soil type: Simonton loam

Crop rotation: Alfalfa 9 to 10 years followed by spring grains for 3 years

William Simon's family has farmed on the Camas Prairie at Fairfield, Idaho, since 1937. He has been in the farming business since 1959, and now farms with his two sons. His son-in-law, Matt McLam, joined the family farm in 1986. Together they farm well over 5,000 acres organically.

For this family farm, each member holds land in a separate corporation, and owns equipment individually. However, they use similar practices and work together. Each has a specialty such as seeding or harvest and they pay each other custom rates for doing the work.

The Camas Prairie of southern Idaho surrounds the Camas Creek drainage from Elmore County to Blaine County. Locals consider this the "original Camas Prairie," not to be confused with the Camas Prairie up near Grangeville, Idaho.

The growing season in this high-altitude (5,000 ft) valley that lies south of the Sawtooth Mountains is short — June 1 to September 1 — and the summers are mild, though in 2013 they did experience some days above 90°F. Most of their precipitation falls as snow, so summers are dry. Soils in the valley are sedimentary gravel or clay with a pH between 6.5 and 7.

Getting started

The Camas Prairie is a unique area in that the short growing season has not allowed for the return on investment needed to justify the use of synthetic fertilizers and chemicals. Many of the farmers in the area are "organic by default" (Figure 12.1). Similarly, William says he didn't need to "change much to be organic. I got a premium for doing the same things." He certified his whole farm around 1995 when the Idaho State Department of Agriculture (ISDA) started its organic program.



Figure 12.1. William Simon and Matt McLam farm organically in a high-altitude valley south of the Sawtooth Mountains of Idaho. (Photo by Diana Roberts, WSU Extension.)

Matt agrees that for most farmers on the prairie, "Organic is a way of life. We can't afford to spray."

Crop rotation

Originally William farmed a winter wheat–summer fallow crop rotation. The prairie is "pretty flat so water erosion wasn't a problem," he says. But in the 1960s he switched to spring grains to avoid snow mold and freezing temperatures that occurred in June. Nowadays his crop rotation is confined to spring grains and alfalfa hay. There is a little winter wheat grown further east in the valley.

Typically, William grows alfalfa for nine or ten years, getting one to two cuttings of hay per season. He follows the legume with three years of spring grains. Yields tend to fall off rapidly after the alfalfa, but his spring wheat averages 18 bushels/acre and barley, 28 bushels/acre.

Spring wheat is more sensitive than spring barley to cold snaps during head development, Matt finds, so he grows all his spring wheat dryland to keep down the input costs. His spring wheat yields run between 15 and 20 bushels/acre.

Spring barley has a lower price potential (as feed grain), but Matt includes it in the rotation because it is a hardier crop (Figure 12.2). His dryland yields for Jefferson barley are 20 to 30 bushels/acre, which increase to 80 bushels/acre under irrigation.

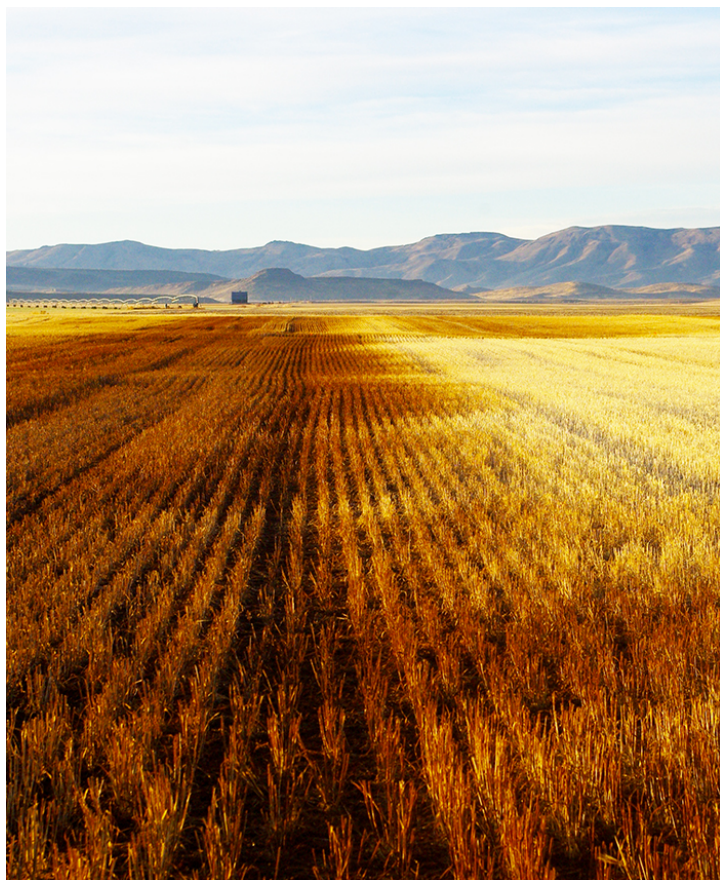


Figure 12.2. Spring barley is a hardy crop that is well suited to the climate on the Camas Prairie. (Photo by Cindy Kinder, UI Extension.)

On his alfalfa ground, Matt gets one to two cuttings if it is irrigated, but only one on dryland. While he has been happy with grain prices the past few years, in the past his focus has been alfalfa hay with the grain grown only as a rotation crop.

Soil fertility management

William uses alfalfa in his crop rotation as his primary soil fertility management. The alfalfa adds soil organic matter (as well as nitrogen). “Valley-wide the soils are low in sulfur,” he adds.

At one time he participated in a study using gypsum to increase levels of sulfur and calcium. The ground-up gypsum was a mined, natural product. However, in the study it did not increase crop yields so he didn’t continue to use it. The study was conducted over three years, but not on the same ground. If applied to the same fields over several years “we might see a yield difference,” William notes.

William also has fallowed ground at times, but he emphasizes, “Summer fallow is not for moisture conservation as [we have] winter precipitation. The fallow period does allow for mineralization of soil nutrients so they are available to the following crop.”

William does not use summer fallow for moisture conservation, but rather to allow nutrients time to mineralize and become available for the following crop.

Recently Matt participated in a study with the University of Idaho Extension testing manure applications on his barley. Although they maintained the plots for four years and kept the treatments on exactly the same ground, he was surprised “there wasn’t a more marked distinction between use and non-use of the manure.”

Consequently, he hasn’t continued the manure applications. He adds, “It’s like fish oil. The nutrient [content] is so low for the cost, you can’t afford to put on a lot.”

Weed and pest management

William uses a heavy-duty sweep (undercutter), run 5 in. deep, to take out alfalfa stands. He prefers to do this in the fall, prior to seeding spring grains. If some of the alfalfa re-grows, it is generally not a problem in the barley, though too much green material can cause threshing problems at harvest.

Matt also uses tillage in the spring to prepare for seeding grains. First, he disks the ground once and follows with a harrow or roller harrow to prepare the seedbed. He limits preparation to two passes across the field because with his low yield potentials, “you’d better not be burning too much diesel,” he says.

He seeds with a double-disk drill on 6-in. centers, which enables the crop to be competitive against weeds. He maintains, however, “This narrow-row spacing doesn’t lend itself to any post-emergence weed control.”

In general, the Camas Prairie is too cold for farmers to have major insect problems, though William does find bugs and beneficial insects caught on the cutter bar of his machinery. He used to deal with alfalfa weevil in his early years of farming, but “1994 was a very cold winter and we haven’t had weevils since then,” he says.

With low yield potentials in his area, Matt is conscious of the fuel cost of every field operation he uses.

Taking advantage of cold winters and birds of prey to manage insect and rodent problems helps reduce input costs.

Some years there can be a buildup of grasshoppers, armyworms, or voles and pocket gophers. But winter will wipe out the rodents. “Wait,” advises William. He also notes that birds of prey help to manage them and he has observed “one raptor per power pole” near his fields. Swainson’s hawk and the peregrine falcon are common in the area.

Not having to deal with pest problems due to the cold winters keeps their inputs low. “This makes it feasible for us to farm organically,” says Matt.

He has seen armyworm and grasshoppers on occasion, but they run their course and then die out. The last time he had to spray for an insect problem was seven years ago. That field was then returned immediately to organic transition.

Marketing and certification

William markets his hay directly to organic dairies in Washington, Oregon, Colorado, Texas, and some in Idaho. He sells feed barley to individual dairies and hard red spring wheat to an organic mill in Utah. “Anheuser Busch had a program in the area, but then they dropped the whole valley [for quality reasons],” says William. His was the only farm with acceptable grain, but he went to growing feed barley anyway.

He sells his alfalfa hay as compressed bales, but does not plan to pelletize it, as “dairies need rougher stuff.”

William markets to dairies on a year-round basis. He sells on the market at harvest, but increases the price for storage and interest. “I have an oral agreement [with the dairies],” he says.

“I’ve seen a decent premium the last couple years [2012-2013],” he adds. He has benefitted from having a long-standing relationship with his buyers. It was tough during the recent recession, but now there’s not enough product to meet the demand.

Matt joins with Simon Farms to sell his grain because they have storage tanks (and can combine grain to meet shipments). He has utilized the facilitation service offered locally by Lou Anderson (see his [case study](#)) to sell hay to organic dairies.

“I’ve been extremely pleased with how Lou has taken care of us [on the Prairie],” he states. Both Matt and William have land in transition to the organic program at all times. If they have to use herbicides on a field due to weed problems, they deal with the problem and then immediately put the land back into transition.

Matt explains that for these acres in transition (land purchased recently or where they have sprayed problem weeds), they benefit from including that ground in the certification program, “so the inspector covers it all and knows what is going on.”

Matt will also use the transition period to establish alfalfa hay. “I have one [seedling] year with no production anyway, so I don’t lose anything by having it in transition,” he says.

Matt McLam gains efficiency by establishing alfalfa hay crops in fields under transition to be certified organic.

William says complying with organic regulations is “a lot of paperwork.” He is certified with an agency out of California, which he finds to be cheaper than ISDA for a business of their size. “It has the same standards [as ISDA],” he adds.

When he was first certified organic, William followed the rules as they were set out. He has found it beneficial also to learn via attending conference such as the Western Forage Growers annual meeting and the California Hay Symposium.

Benefits and challenges

Matt comments that it was an advantage having enough ground to cycle fields in and out of organic, if needed, to manage a weed or insect problem. He adds, “If it were all organic all the time, we probably wouldn’t make it.”

Weeds are the biggest problem William encounters in his organic system. Common species are common lambsquarters, bulbous bluegrass, and redroot pigweed. Perennial weeds include Canada thistle and morningglory (field bindweed).

The alfalfa will choke out the annual weeds, but the crop is not as competitive against the perennials. William has observed that a good stand of alfalfa (under irrigation) can choke out the Canada thistle. He uses tillage prior to seeding grains to control weeds, but doesn’t do any in-crop tillage.

Moisture management

Most of Matt's ground is dryland. However, in recent years the winter snowpack has been so low the family has depended on irrigated ground to make their farm economics work. They have to manage their water applications in conjunction with frost risk. In their area they often get frosts in June, when spring crops are often at a sensitive growth stage.

Consequently, Matt will seed his dryland fields early to take advantage of moisture in the soil. On his irrigated fields that have higher input costs, he delays seeding so that frost is less likely to damage developing florets in the grain head.

Farmers on the prairie who irrigate, source their water from wells. Currently Matt is pumping from 65 to 70 ft deep, so the cost is less than in many regions. The family used to have wheel lines, but has converted to center pivots (half a mile long) as they are easier to run and apply water more efficiently and uniformly. They don't irrigate the corners, but are able to "jockey the water rights around" among their fields to make the most efficient use of the water.

Advice for other growers

When asked how he would advise a farmer considering going organic, William cautions, "See if fits in your overall program for your farm. Try it first on a field or two."

Matt (Figure 12.3) came into farming with a business background (he was a banker), so, he says, "I've lost nothing going into farming, watching those who made it and those who didn't. I didn't grow up on a farm so I'm not in love with the land, so all my business decisions must pencil out financially."

"We see a lot of salesmen peddling products," he adds. "I'll try something on a [few acres], but if I can't see a difference, I won't use it again. From the business point of view, I'm bullheaded about it. I've got to be able to see the [benefit] of the product!" Matt stresses.

"It's the [selling] price that keeps us in organic," he says. "We have to have enough acres to have some in organic and some in transition. If we insisted that [our land] was all organic all the time, we probably wouldn't make it."



Figure 12.3. Due to his background in business, Matt McLam insists that all his farm-management decisions pencil out financially. (Photo by Diana Roberts, WSU Extension.)

What does the law say?

Who can certify your operation?

William says he is certified through an agency in California. Farmers who want to farm organically can be certified through any of the USDA-accredited certifying agents. A complete list can be found [here](#). Accredited agents are authorized to issue certificates that comply with USDA organic regulations. The USDA recommends selecting your certifying agent based on the following criteria: 1) distance to your operation; 2) fee structure; 3) accreditation to other programs; and 4) other services provided such as educational resources.

You can find the complete National Organic Program regulations online [here](#) and the Guide for Organic Crop Producers [here](#).

There is also a guide to organic certification that you can access [here](#).

Appendix

Common and scientific names of weeds mentioned in the case studies

COMMON NAME	SCIENTIFIC NAME	OTHER USED NAMES
Blue mustard	<i>Chorispora tenella</i> (Pall.) DC.	purple mustard tenella mustard
Bulbous bluegrass	<i>Poa bulbosa</i> L.	
Canada thistle	<i>Cirsium arvense</i> (L.) Scop	Californian thistle creeping thistle field thistle
Common lambsquarters	<i>Chenopodium album</i> L.	goosefoot
Feral rye	<i>Secale cereal</i> L.	cereal rye common rye
Field bindweed	<i>Convolvulus arvensis</i> L.	morningglory creeping jenny
Jointed goatgrass	<i>Aegilops cylindrical</i> Host	jointgrass
Quackgrass	<i>Elymus repens</i> (L.) Gould	couchgrass quickgrass
Redroot pigweed	<i>Amaranthus retroflexus</i> L.	redroot amaranth
Russian thistle	<i>Salsola tragus</i> L.	tumble thistle tumbleweed
Whitetop	<i>Cardaria draba</i> (L.) Desv.	hoarycress
Wild mustard	<i>Sisymbrium altissimum</i> L.	tumble mustard Jim Hill mustard
Wild oats	<i>Avena fatua</i> L.	oatgrass

References and further reading

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