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FLEX CROPPING AND PRECISION AGRICULTURE TECHNOLOGIES, BILL JEPSEN

Farmer-to-Farmer Case Study

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FLEX CROPPING AND PRECISION AGRICULTURE TECHNOLOGIES, BILL JEPSEN

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Abstract

Bill Jepsen farms in northeastern Oregon, in an area receiving 12 inches or less of annual precipitation. In this publication, Bill Jepsen discusses his operation's strategy for flex cropping to make his farm as profitable and sustainable as possible. He has been trying various strategies and plans since the early 1990s and shares his experience for other farmers to consider.

This case study is part of the Farmer-to-Farmer Case Study project, which explores innovative approaches regional farmers are using that may increase their resilience in the face of a changing climate.

Information presented is based on growers' experiences and expertise and should not be considered as university recommendations. Mention of trade names or commercial products is solely for the purpose of providing specific information and does not imply recommendation or endorsement.

Grower quotes have been edited slightly for grammar and clarity, without changing the meaning.

Readers interested in other case studies in this series can access them at reacchpna.org/casestudies, as well as in the WSU Extension Learning Library.

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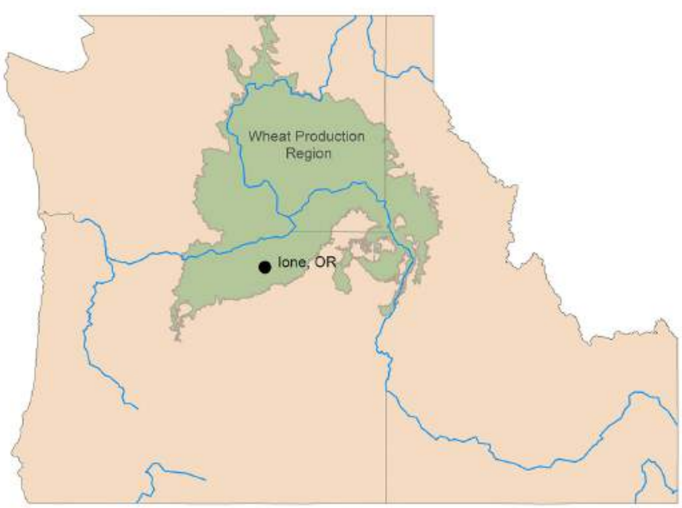
Flex Cropping and Precision Agriculture Technologies, Bill Jepsen

Location: Near Ione, OR

Precipitation: 12 inches annual average

Cropping system: Flexible—winter wheat after fallow with spring wheat (dark northern and soft white), spring barley, and re-cropped winter wheat when rainfall allows.

See the companion video that introduces Bill Jepsen and describes the major benefits and challenges of flex cropping.



Introduction

The area of northeastern Oregon where Bill Jepsen farms receives an average annual rainfall of 12 inches or less. To cope with these dry conditions, farmers have traditionally used a rotation of winter wheat after summer fallow. However, over the last twenty years, Jepsen has been one of a just a few farmers in the region who have experimented with intensified production.

Jepsen currently farms about 4,600 acres using a flex cropping system. When the land receives sufficient over-winter precipitation, Jepsen replaces fallow with spring wheat and barley, or occasionally re-crops winter wheat without fallow.

The flex cropping system provides a range of benefits as noted by Jepsen: “Our goal is to make the most profit, over the long haul. The flexible rotation allows us to sneak in a crop on otherwise fallow ground.”

At the same time, this strategy makes his system more resilient. Spring cropping helps control grassy weeds, while the additional residues help build soil organic matter, improve soil structure and aggregation, and increase water infiltration and water-holding capacity.

Developing Experience with Spring Crops

In the early 1990s, Jepsen started experimenting with spring crops to improve the management of fall grassy weeds. However, he soon realized that spring crops might help him more closely match the limitations of his soils (Valby silt loam and Rhea silt loam; NRCS 2013), which are rocky, permeable, and shallow (2 to 3 feet), with a solid basalt bedrock at a depth of 20 to 36 inches (Figure 1). Soil depth limits the amount of water that can be stored during the fallow year.

“Basically, from the middle of April onward, we lose all of the rain we receive during the summer and into the beginning of the fall, plus another inch out of the profile. So, with that inefficiency, why not try to take some of the water that’s going to end up evaporating, and try to grow a crop with it?”

With multiple passes required to prepare the soil for planting, Jepsen struggled in those early years to plant spring crops early enough to achieve good yields in his area. However in 1999, he had a breakthrough when he converted the farm to direct seeding in an effort to address erosion, which had been a serious issue for some time.

Figure 1. This pile of rocks picked from surrounding fields is evidence of Jepsen's rocky soils. Photo: Jepsen Family.

After a few years, he found that direct seeding not only greatly reduced erosion (Figure 2), it also improved his ability to spring crop because he was getting into the field earlier, planting more quickly, and banding his fertilizer. Together, these three changes let him successfully grow a crop within the compressed spring window.

Jepsen explains, "The structure of the soil changed within two or three years, to where crusting was no longer a factor…. We can get in the fields earlier because the untilled ground has better water infiltration. So, where we might be able to get into the field typically in March on conventional ground, on no-till ground, it's usually the third week of February. In most years, I can finish my seeding by early March" (Figure 3).

Figure 2. This photo, taken after a winter rain event on frozen soil, shows no visible erosion on the stubble in the direct seeded field (background), but quite a bit of water erosion where water has run onto the adjacent fall planted, conventionally tilled field (foreground). Photo: Bill Jepsen.

Figure 3. Planting early (in late February and early March) is one key to successful spring cropping on Bill Jepsen's farm. Photo: Bill Jepsen.

Many of Jepsen's early experiences with direct seeding and spring cropping are captured in a 2001 case study (Mallory et al. 2001; see sidebar: Jepsen's Reflections on the 2001 Jepsen Farm Case Study). At that time, he anticipated that he would be able to grow continuous spring crops with direct seeding. The strategy worked well for the first years he tried it, but those years were wetter than average. When drier years followed, he reassessed.

In developing his current system, Jepsen relied heavily on historical weather records for his farm, which his father began collecting in 1963. However, he noted that those thinking about flex cropping do not necessarily need to collect their own weather data, since similar information is generally available from the National Weather Service or an Extension Office.

Jepsen's Reflections on the 2001 Jepsen Farm Case Study

Bill Jepsen, a longtime innovator, was profiled in 2001 as part of a case study series about direct seeders (Mallory et al. 2001). In 2013, Jepsen reflected on the 2001 case study.

"When the original case study was written, it had been after three good crop years. Maybe we were a little bit cocky. We'd been growing continuous crops that were yielding as good as the crops grown after summer fallow, and we thought, 'Man, we really know how to do this.' Then in 1999, it quit raining. For four years, we had average to below-average rainfall, and we learned very quickly, there are years you can't grow crops continuously. That's why we came up with the flex rotation as a way of deciding how much water we need during the winter to have the ability to go ahead and grow a spring crop."

Jepsen's Current Flex Cropping System

Like most other direct seeded acreage in the low rainfall area, Jepsen's current base crop rotation is winter wheat after chemical fallow (Figure 4). However, after a wet winter, instead of fallowing, he plants a spring crop that generally consists of spring barley, dark northern spring wheat, or soft white spring wheat (Figure 5). He also occasionally re-crops winter wheat when available water conditions are favorable in the fall.

Figure 4. With flex cropping, Jepsen still grows a fair amount of winter wheat after chemical fallow Photo: Bill Jepsen.

Figure 5. Spring wheat is shown growing in the winter wheat stubble from the previous year. When sufficient water is stored in the soil profile over the winter, Jepsen plants spring wheat or spring barley. Photo: Bill Jepsen.

The amount of available water in the soil is Jepsen's primary decision-making factor for flex cropping—but not the only one.

Jepsen explains, "Our average soil has about 2 1/3 inches of available water at field capacity per foot. So, if we're wet down to 30 inches in the third week of February, we'll usually make the decision to grow spring crops."

Jepsen tracks precipitation throughout the winter, but his final decision to plant spring crops is made by checking the soil water during the third week of February. Sometimes he takes soil cores, but usually he can tell how far the soil has wet from the feel of the probe as it moves through the soil. Jepsen normally tests about 10 different locations, across different soil types.

When water is marginal, the decision of whether and how much to plant is also informed by the markets, weed control needs, crop insurance premiums and guarantees, and Jepsen's current attitudes towards risk.

"You don't know what kind of spring rains you're going to receive. With the shallow soils that we have here, spring precipitation is critical to a good crop."

Jepsen cautions that soils and precipitation need to be appropriate in order for flex cropping to work (see sidebar: Resources for Flex Cropping). In areas that are drier and have deeper soils, winter wheat after summer fallow is likely to remain a mainstay.

For example, in areas directly north of Jepsen's farm, which have soil depths of four to five feet, Jepsen notes, "They can store water a little better than we can, and with ten inches annual rainfall, they don't often get enough rain to grow a crop successfully without fallow—maybe ten, fifteen percent of the years."

Resources for Flex Cropping

Farmers seeking to adapt flex cropping for their conditions may find *Agronomic Guidelines for Flexible Cropping Systems in Dryland Areas of Oregon* (Lucher et al. 2009) helpful. Topics discussed include guidelines for minimum plant-available soil water content needed for fall and spring planting, and flex cropping options dependent on the effective rooting depth. Several specific examples are used to illustrate the principles discussed in the bulletin.

Tillage

Jepsen emphasizes that in his experience, flex cropping is most successful with direct seeding.

"It almost won't work without it. The direct seed difference is so big, for several reasons—you can seed earlier, you can band all your fertilizer below the seed, and you can seed a whole lot more acres in a short time. Plus the direct seeded ground that's been in direct seed for several years won't crust. Crusting was a terrible problem when we used to have full width tillage."

For seeding, Jepsen uses a Cat Challenger MT755B (300 HP) tractor, a Flexi-coil air cart, and a 40 foot Conserva Pak Drill. Among drills with hoe-type openers, this drill has one of the lowest levels of soil disturbance (Figure 6). Seeding is above and to the side of the shank mark, in an undisturbed spot, which Jepsen finds tends to help keep the seed from drying out. He has also been quite pleased with the relatively low maintenance required for the drill.

Figure 6. A close-up showing the openers on Jepsen's Coserva Pak Drill. Photo: Bill Jepsen.

Crops

Jepsen's three major spring crops are barley, dark northern spring (DNS) wheat, and soft white spring wheat. Among these crops, DNS is higher risk to plant, because it requires more fertilizer and the crop is sold at a discount if protein goals are not met.

As Jepsen explains, "If we get late spring rains, and then we don't make protein, we can really take a beating if the protein discounts for that year are severe…. But it is also typically worth anywhere from a $1.00 to $1.50 more per bushel than white wheat, if we do make protein goals."

Barley is a crop Jepsen likes to plant because it does well in his area, provides higher amounts of residue, and adds some rotational diversity, even though it is still a cereal. Unfortunately, in recent years, barley prices have not been competitive with wheat.

From 1999 to 2009, with support from Monsanto and Oregon State University (OSU), Jepsen experimented extensively with a number of rotational crops, hoping to enhance crop diversity (Machado et al. 2006, 2007, 2008, 2009). Over this decade, he grew oats, triticale, spring and winter canola, camelina, mustard, safflower, flax, garbanzo beans, lentils, and narrow leaf lupines—all in rotation with winter and spring wheat and fallow.

"We grew all those different crops during some really dry years and some fairly good years, and learned what worked and what didn't."

Unfortunately, Jepsen discovered that none of these crops were profitable on his operation. Today, he is back to growing cereals: wheat, barley, and occasionally oats.

Initially, Jepsen was very enthusiastic about spring mustard, which grew and yielded well, until he realized that after growing mustard, a poor wheat crop would follow. As Jepsen says, "It was doing just the opposite of what we expected with a rotation crop."

Working with Dick Smiley from the Columbia Basin Agricultural Research Center, he discovered that the mustard was benefitting root lesion nematodes, roughly tripling the populations.

Jepsen finds these types of on-farm demonstrations, along with experiments on the nearby OSU experiment stations (in his case, Moro), to be a key resource. He also says that although he is not currently growing any alternative crops, he has seen the rotational benefits firsthand, and continues to look for crops that would work in his area.

Nutrient Management and Precision N

Jepsen had to adapt his nutrient management for spring crops (see sidebar: Resources for Fertilizing Spring and Winter Wheat) and finds that banding all of his fertilizer is key. "What you're trying to do with a spring crop is… grow a whole wheat crop…in a limited amount of time" (Figure 7). Like most farmers in his area, Jepsen has cut fertilizer costs by using guidance and auto-steer.

Figure 7. The plants in the foreground of this photo did not receive banded fertilizer, and are nutrient-deficient as a result. Photo: Bill Jepsen.

Resources for Fertilizing Spring and Winter Wheat

The WSU Wheat and Small Grains team has made several online decision support tools available here. Among these are a dryland wheat nitrogen fertilizer calculator for a number of spring and winter wheat varieties (Esser 2014). The calculator builds on information available in the *Dryland Winter Wheat: Eastern Washington Nutrient Management Guide* (Koenig 2005).

Because soil depth (and therefore yield potential) varies substantially over the farm, Jepsen has shifted to variable rate nitrogen applications in recent years. This strategy has been especially helpful as fertilizer has become more expensive. He uses three N application zones: low, medium, and high. Without a yield monitor, he has relied on infrared aerial photos to create his prescription maps for fertilizer application.

"The photos work very well for us, showing the productive ground and the poor areas—it gives you nice lines to draw. It's easy to do."

In 2013, with all acreage planted, and with particularly dry conditions in the late spring, Jepsen had infrared aerial photos taken for the entire farm. Areas where plants were stressed showed up well (Figure 8).

These areas generally corresponded to shallower soils, and matched with Jepsen's own sense of which areas produced poor yields.

With the zones defined, Jepsen determines how much fertilizer to apply based on the results of soil tests conducted just before planting. He uses one composite sample for each of the three zones. Jepsen finds that based on the previous year's growing conditions, the difference in fertilization rates between the high and low zones can vary quite a bit. In many years the lowest zone receives less than half of the fertilizer that the highest zone receives.

Management of Weeds, Diseases and Pests

Without tillage, Jepsen relies heavily on herbicides to control weeds—as do most direct seeders. Glyphosate is the major herbicide used on the farm, but other herbicides with different modes of action are used to help reduce the risk of developing herbicide-resistant weeds.

Using the other, generally more expensive, herbicides is easier because he has several precision agriculture tools on his sprayer: auto-steer, auto boom section control, and auto rate control (Figure 9). In the last few years, he has sprayed a mixture of 2, 4-D and Huskie on his fallow acreage to help control prickly lettuce, a weed that Jepsen has found does not respond well to glyphosate.

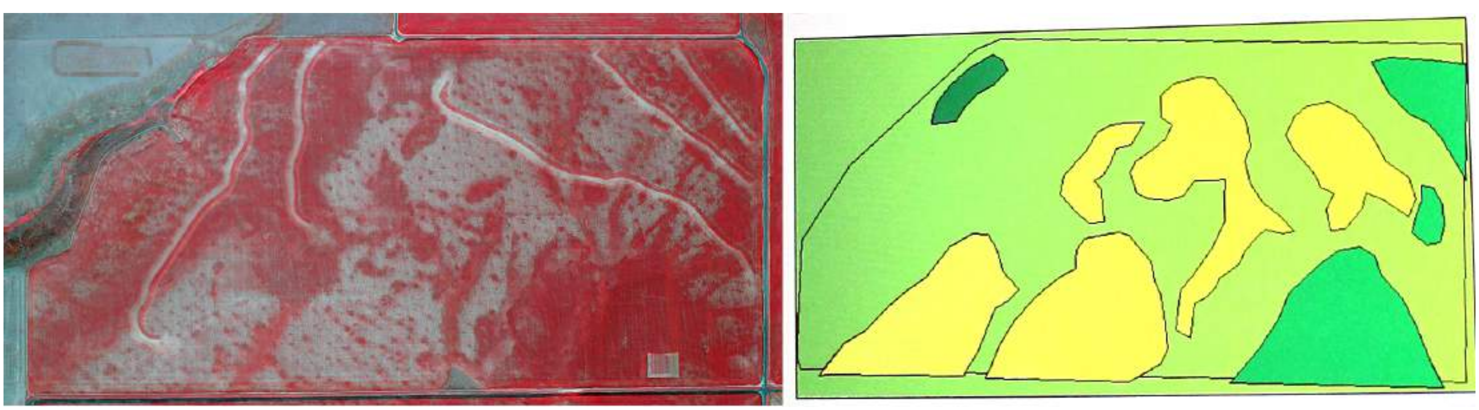


Figure 8. The photo on the left shows the infrared aerial image. On the right is Jepsen's prescription map for one of the farm's fields. In the infrared photo, the most dense and vigorous vegetation is shown in bright red, whereas less vigorous plants are shown in lighter red and grey tones. Jepsen has translated the infrared images to the prescription map as areas that will receive high nitrogen application rates (dark green), medium (light green) and low (yellow) rates.

Figure 9. Jepsen's sprayer has auto-steer, auto boom section control, and auto rate control. Photo: Bill Jepsen.

He also uses a small 40-foot weed-seeker sprayer to spray chemical fallow acreage in the late summer, and to spray Russian thistles in stubble after harvest (Figure 10). Equipped with photo eyes, the sprayer only sprays when it senses a green plant, thereby reducing the area sprayed.

Jepsen has mixed feelings about the WeedSeeker sprayer, although he feels the positives outweigh the negatives in his case. While the sprayer cuts costs, and can be a handy tool, it requires a lot of maintenance. Because it is only 40 feet wide, it takes more time to cover an area than his regular 103-foot sprayer.

The advantage of the WeedSeeker sprayer is that it allows Jepsen to use a higher spot-spraying rate, which increases herbicide efficacy and decreases overall herbicide usage and expense. It also enables Jepsen to use more expensive tank mixes than he would otherwise be able to afford.

Figure 10. Jepsen's 40-foot WeedSeeker sprayer. Photo: Bill Jepsen.

Growing spring crops has also helped Jepsen manage fall grassy weeds.

"Our worst weeds here are jointed goat grass and cheat grass (downy brome). And…with spring crops, you can take care of those."

In the last few years Jepsen has planted fields with a severe grassy weed problem to Clearfield wheat—a strategy that he feels has been worth the added expense of certified seed and herbicide.

In terms of pest management, Jepsen says that direct seeding and more intensive rotations have increased his wireworm populations, though seed treatment has limited damage. The farm also has a problem with root-lesion nematodes, however, rotating to spring barley has been the most effective tool for dealing with the pest.

One small trick that Jepsen uses to simultaneously help manage pests and keep flex cropping working smoothly, is to fall spray the stubble in fields that are coming out of crop. These are fields that will either be fallowed or planted the following spring.

Jepsen sprays a lower rate of glyphosate after the fall rains begin (normally in November) as the volunteer wheat and grassy weeds emerge. This improves disease and pest control by eliminating plants that could harbor the organisms over the winter.

Fall spraying is also beneficial to flex cropping the following spring. If he plants a spring crop, Jepsen sprays a minimum rate of glyphosate on any small weeds that have emerged, and seeds the next day without worrying that a "green bridge" is harboring root diseases.

If he decides to put the field into chemical fallow, there are other benefits to the fall herbicide application. Specifically, he can delay the first spring herbicide application until the first week of May, when head emergence of downy brome and rattail fescue occurs, and when glyphosate treatment is more effective.

Benefits

According to Jepsen the primary benefit of flex cropping is fairly evident: by cropping acres that would otherwise be fallow, he has the potential for profits on additional acres. At the same time, spring cropping improves the management of fall grassy weeds, and intensified cropping has improved soil quality.

Within the first few years, he noticed marked improvements in soil aggregation, structure, and tilth from direct seeding and more intensive cropping. Water infiltration and water holding capacity have also improved (Figure 11). Over the longer term, Jepsen is also hopeful that he can rebuild soil organic matter levels.

Figure 11. By cropping more intensively, Jepsen adds more residues to his soil. Increased residues have improved water infiltration, water holding capacity, soil structure, and soil tilth. Over time, increased residues will also help maintain and build up organic matter in the soil. Photo: Bill Jepsen.

"We tilled the soils here for 100 years. The organic matter of the native prairie was around three percent. With tillage, we mined that down to less than one percent. The goal with direct seeding is to slowly build that back…. But research has shown that when you rotate winter wheat with summer fallow, organic matter just won't increase much, if at all [Machado 2011; Gollany et al. 2013]. You need a crop growing every year. The problem is, we're too dry to grow a crop every year. So, we try to grow a crop every year when we can."

Though variability in soil test readings by different labs make it difficult to see trends, Jepsen has noticed that tested soil organic matter levels have generally increased since he started flex cropping. Over time, he feels this strategy will help maintain, and perhaps eventually increase, his overall yields.

Challenges

Labor is a key constraint that Jepsen needs to manage to successfully grow spring crops. He runs his drill 18 hours a day in the spring, with the goal of having all his spring crops planted by the end of February or early March—the sooner the better.

Earlier planting provides a long growing season and allows the crop to mature before the hottest and driest part of the summer. Having enough labor during harvest can also be somewhat of a challenge if the whole farm is cropped (Figure 12).

Figure 12. In years when he plants more acreage than normal, having enough labor at harvest time is a challenge. Photo: Sylvia Kantor.

Making flex cropping decisions will likely always be difficult, because it is impossible to predict growing season weather. "The goal is to know when to do the flex cropping. It's always a struggle, because you can't look into the future."

After the decision to spring crop is made, Jepsen must also decide on his fertilizer rates. For example, with drought-like conditions in 2013, Jepsen wishes he had applied much less fertilizer on shallower ground. Such challenges also exist with a winter wheat after summer fallow system, but Jepsen finds they are greater with flex cropping.

Plant-back restrictions are also a challenge, and flex croppers need to be aware of them. For example, Jepsen sometimes uses the herbicide Beyond during a winter wheat crop. Since plant-back restrictions for wheat after Beyond applications were increased to 15 months for his soil type and precipitation zone, he has been forced to purchase Clearfield spring varieties for spring flex fields to avoid crop injury. Plant-back restrictions for spring barley are 18 months in his rainfall zone, thus eliminating the possibility of growing this crop after using Beyond.

Lastly, Jepsen feels that having few rotational crops remains a management challenge for growers in dry areas.

Managing Risk

Because there are more swings in annual income, flex cropping can be thought of as a high risk strategy. However, because Jepsen has either equivalent or greater acreage cropped overall than under a traditional rotation of winter wheat after summer fallow, he feels flex cropping provides higher financial rewards, which compensate for increased variability (see sidebar: Cropped Acreage Is Higher, but More Variable, under Flex Cropping).

Cropped Acreage Is Higher, but More Variable, under Flex Cropping

The percentage of Jepsen's farm in winter wheat, fallow, or a spring grain can change dramatically from year to year, but overall his cropped acreage is higher than before flex cropping, averaging 66% from 2005 to 2014 (Figure 13). The crop percentages in Figure 13 represent the area harvested in that year. All crops are planted on acreage that was previously cropped, except winter wheat planted into fallow.

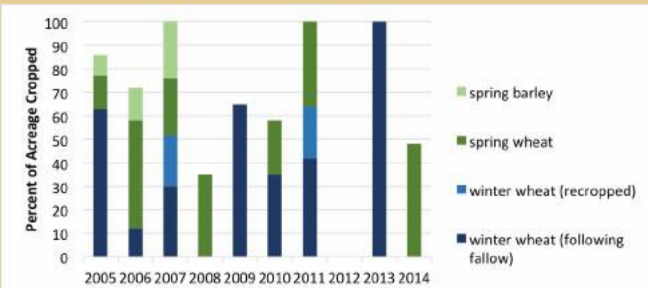


Figure 13. The percentage of Jepsen's farm in various crops from 2005 to 2014. Land not being cropped is fallowed.

The amount of acreage planted in the year following 100% cropped acreage can be particularly uncertain. For example, compare 2007 to 2008, 2011 to 2012, and 2013 to 2014. In 2007, good conditions allowed for planting the entire farm to a combination of winter wheat following fallow, re-cropped winter wheat, and spring crops.

In 2008, following a wet winter, Jepsen planted 35% of the farm to spring wheat and fallowed the rest, which put the farm back into a roughly half-and-half rotation of winter wheat following summer fallow, with half of his acreage (or more) cropped each year.

However, the years 2011 to 2012 didn't work out so neatly. In 2011, with nearly perfect conditions, Jepsen again seeded the farm to a combination of winter wheat following fallow, re-cropped winter wheat, and spring crops.

When spring conditions continued to be good, they achieved record harvests.

"For us, 45 bushel is a good average yield for summer fallow, winter wheat. Our goal is about 30 bushels for spring wheat. And that year, I think we had about 62-bushel summer fallow winter wheat, 39-bushel re-cropped winter wheat, and 36-bushel spring wheat. Excellent yields. We cut more grain than we ever have in the history of the farm."

But the next winter was dry. In late February 2012, with water penetration only averaging 15 inches, Jepsen decided to put the entire farm into a year of chemical fallow. Two strategies helped reduce the negative financial impact on his farm.

First, he had saved a sizeable portion of the 2011 harvest to sell in early 2012 (Figure 14). This spread out his income and limited his overall tax liability. Second, he had saved much of the extra income from 2011 knowing that he might not have any income in 2012.

Figure 14. In years when Jepsen has harvested grain on all of his acreage, he stores some of the grain to sell in the following year, limiting his tax liability by spreading crop income over two years. Photo: Bill Jepsen.

In 2013, Jepsen had all his acreage planted in winter wheat following summer fallow.

In 2014, despite only 25 inches of soil water penetration, less than he likes for spring cropping, he decided to plant roughly half of his acreage to spring wheat. Given somewhat marginal soil water, he targeted specific acreage to minimize risk and maximize the benefits. The acreage he chose to plant included land with shallower soils, as well as some new acreage with severe grassy weed problems.

These areas, with only two feet of soil, were saturated even under the dry conditions, leaving his best ground to be seeded to winter wheat after a year of chemical fallow.

To reduce the risk associated with income variability, Jepsen has changed the way the farm's finances are managed. In 1998, he was able to eliminate farm debt, and has built up cash reserves. He also plans ahead for the anticipated low- or no-income years, which normally follow years when most or all of the farm is planted.

Jepsen feels that insurance plays a key role in mitigating risk in a dry area such as his (see sidebar: Federal Crop Insurance and Actual Production History).

"Our yields can vary from 20 bushels per acre on summer fallow wheat up to 65. And because of that huge variation, crop insurance is always an important part of our management here. Unless it gets too expensive, we will continue to purchase it."

Beyond its general importance, he also points out that crop insurance is key to their flex cropping strategy.

"The crop insurance for a spring wheat covers less than winter wheat after fallow, but it does cover the costs of production and a small profit."

Over the longer term, Jepsen hopes that the improvements in soil quality and weed control that result from flex cropping will make his farm more resilient.

Future Directions

Jepsen continues to try new alternative crops. In 2012, he tried a new strategy for early planting of winter canola, which other growers in the region have found successful (see sidebar: Biennial Canola). From prior experience, Jepsen knew that getting a stand was difficult during the normal planting window (the end of August through the beginning of September), because conditions are hot and dry. He also knew that winter canola generally grows well once it is established.

Working with Don Wysocki, an extension scientist then stationed at OSU's Columbia Basin Agricultural Research Center in Pendleton, OR, Jepsen put in test plots of biennial canola in late June 2012, after at least a quarter inch of rainfall (Figures 15 and 16). The crop was harvested in early 2013, and seeded back to spring wheat in 2014. He is eager to see whether the canola improves yields of the spring wheat crop.

Federal Crop Insurance and Actual Production History

Kate Painter, University of Idaho

The United States Department of Agriculture Risk Management Agency (RMA) operates and manages the Federal Crop Insurance Corporation (FCIC). RMA, through FCIC, provides crop insurance to American farmers and ranchers. Private-sector insurance companies sell and service the policies. RMA develops or approves the premium rate, administers premium and expense subsidies, approves and supports products, and reinsures the companies. RMA also sponsors educational and outreach programs and seminars on the topic of risk management.

Across the Pacific Northwest dryland wheat production area, wheat producers can insure from 50% to 85% of their production under the revenue protection plan, receiving a subsidy for a portion of the premium. In Morrow County, Oregon where Jepsen farms, the most popular level of protection ("buy up") for wheat was 80% in 2013. The loss ratio for this level was $3.44, indicating that $3.44 was paid out to farmers for every $1 of insurance premium that was paid in. In Whitman County, a county with much more favorable weather for wheat production, the loss ratio in 2013 for the most popular buy up level of 85% was just $0.22 for every $1 of premium paid. In 2014, however, the loss ratio in Morrow County for the 80% buy up was $2.69 while the loss ratio for the 85% buy up level in Whitman County was $2.06, illustrating how the amount of payouts can vary from year to year.

One potential weakness of crop insurance is its reliance on recent production history, which determines how much insurance a grower can buy, as well as the insurance rate. If a grower has a string of poor harvests, their actual production history (APH) will decline.

As Jepsen explains, "We've been very fortunate. We haven't had a dry year here since 2002. We've had some average years, but we've managed to cut good crops. And so we have good APHs, or actual production histories…. If you have multiple bad years, those start to change, and then you can't buy as much insurance. So if we got hit with five or six really tough years here, at the end of that sixth year, we wouldn't be able to buy much for insurance. And it could be really a tough thing. We hope we don't see that."

To help address this issue, the 2014 Farm Bill has authorized a yield exclusion program to help growers who have experienced a prolonged period of yield declines, such as the drought-stricken regions in Texas and California (USDA RMA 2014). More information on this program can be found here.

Figure 15. Working with Oregon State University scientist Don Wysocki, Jepsen planted test plots of biennial canola into standing wheat stubble in late June. Photo: Bill Jepsen.

Figure 16. Year two biennial canola in bloom at the end of May 2013. Photo: Bill Jepsen.

In addition, Jepsen is experimenting with cover cropping on a limited basis, growing a multi-species cover crop on a small amount of fallow acreage, and planting tillage radish along with winter wheat in a separate trial.

Given his limited rainfall, he thinks it is unlikely that cover cropping can be profitably incorporated into his system. However, because the residues could provide a significant benefit to soil organic matter, he feels it is worth investigating whether he can make cover cropping work.

Looking Forward

The primary challenge Jepsen sees is to remain profitable, given that input costs such as equipment, fertilizer, and seed, have risen so dramatically (Figure 17). Fortunately, wheat prices have kept up with inflation, but he feels that higher costs make the farm vulnerable to future price drops.

Investing in precision agriculture technologies and keeping his equipment working as long as possible are two strategies Jepsen uses to minimize the impact of cost increases.

Potential Benefits of Biennial Canola in the Inland Pacific Northwest

Spring planting of winter canola in May or June, rather than maintaining summer fallow and planting in September, has a number of potential benefits. First, stand establishment is improved due to higher soil water in the seed zone.

Second, summer fallow is partially eliminated, which reduces erosion and the costs of weed control. Last, winter survival may be enhanced as well, with a larger plant going into winter; however further research is needed in this area.

Though Jepsen plans to harvest the canola for seed only, research has suggested that economic returns may be increased by harvesting a high quality forage crop during the first year, prior to the main seed crop.

Research showed forage yields from spring planted winter canola ranging from 1.4 to 4.2 tons per acre, which equals or exceeds yields of dryland alfalfa (Walsh 2012). The forage crop cannot be baled like regular alfalfa, however. It must be fed green (unbaled), used for silage, or grazed.

As researchers and growers gain experience with biennial canola across various parts of the Inland Pacific Northwest, they will gain more insight into whether the crop can be profitably incorporated into existing rotations and in what locations.

Figure 17. Both the older and younger generations are actively involved in the Jepsen Farm operation, and Jepsen hopes that the farm will remain profitable into the future. Pictured are Jepsen (right), his father Bob (left), and his daughter Rebecca (center). Photo: Sylvia Kantor.

Advice for Others

Jepsen was asked what advice he would give to other growers who are interested in trying flex cropping.

Try flex cropping if you have conditions where it might be beneficial. "If you're in a drier area with predominantly winter wheat after summer fallow, and you're a direct seeder, you can grow crops without fallow in certain years. Even in the drier areas, the farmers to my north have grown some excellent spring crops, if they pick the right years… If they have a winter where they pick up a tremendous amount of water, they can come back in the spring and do pretty well."

Don't jump in all at once. Jepsen suggests starting with a few fields that will get a big rotational benefit from spring cropping. "You know, everybody has trouble around here with grassy weeds. So, pick the fields that have the worst problems. Those are the good ones to spring crop because you're killing two birds with one stone. You might make some money on the spring crop, as well as control the weeds for another year."

Weather is another significant challenge for Jepsen, but one that has always existed. He doesn't think that climate change presents much of an increased risk—since he has been farming, he has not seen any consistent changes in the climate. Looking at weather records from nearby Heppner, which date back 100 years or more, he believes that any changes have been slight.

Given that farming in his area is so dependent on rainfall, he says that if climate change means wetter conditions, he would be able to adapt without much problem. But given how marginal conditions are currently, he says that if it gets drier, he'd likely have to get a job off the farm.

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References

Esser, A. 2014. Nitrogen Fertilizer Decision Support Tool. *Washington State University Extension*. smallgrains.wsu.edu.

Gollany, H.T., A.M. Fortuna, M.K. Samuel, F.L. Young, W.L. Pan, and M. Pecharko. 2013. Soil Organic Carbon Accretion vs. Sequestration Using Physicochemical Fractionation and CQESTR Simulation. *Soil Science Society of America Journal*. 77(2): 618.

Koenig, R. 2005. Dryland Winter Wheat: Eastern Washington Nutrient Management Guide. *Washington State University Extension Publication* EB1987E. Washington State University, Pullman, WA.

Lucher, L.K., D.J. Wysocki, M.K. Corp, and D.A. Horneck. 2009. Agronomic Guidelines for Flexible Cropping Systems in Dryland Areas of Oregon. *Oregon State University Extension* Manual EM 8999-E. Oregon State University, Corvallis, OR.

Machado, S. 2011. Soil Organic Carbon Dynamics in the Pendleton Long-Term Experiments: Implications for Biofuel Production in Pacific Northwest. *Agronomy Journal*. 103: 253-260.

Machado, S., L. Pritchett, E. Jacobsen, S. Petrie, D. Smiley, D. Ball, D. Wysocki, S. Wuest, H. Gollany, and W. Jepsen. 2009. Center of Sustainability (COS) Rotation Field Experiment – Bill Jepsen, Yield Results 2006-2009.

Machado, S., L. Pritchett, E. Jacobsen, S. Petrie, D. Smiley, D. Ball, D. Wysocki, S. Wuest, H. Gollany, and W. Jepsen. 2008. Long-term experiments at CBARC-Moro and the Center of Sustainability, Heppner, 2007-08. Oregon Agricultural Experiment Station Special Report 1091.

Machado, S., L. Pritchett, E. Jacobsen, S. Petrie, D. Smiley, D. Ball, D. Wysocki, S. Wuest, H. Gollany, and W. Jepsen. 2007. Long-term experiments at CBARC-Moro and the Center of Sustainability, Heppner, 2006-07. Oregon Agricultural Experiment Station Special Report 1091.

Machado, S., L. Pritchett, E. Jacobsen, S. Petrie, R. Smiley, D. Ball, D. Wysocki, S. Wuest, H. Gollany, and W. Jepsen. 2006. Long-term Experiments at CBARC-Moro and Center of Sustainability, Heppner, 2005. Oregon Agricultural Experiment Station Special Report 1068.

Mallory, E., R. Veseth, T. Fiez, R.D. Roe, and D.J. Wysocki. 2001. Direct Seeding in the Pacific Northwest Case Study Series. *Pacific Northwest Extension Publication 540*. Washington State University, Pullman, WA.

Natural Resources Conservation Service. 2013. Web Soil Survey. Natural Resources Conservation Service, United Stated Department of Agriculture.

United States Department of Agriculture. 2013. Policies. USDA Risk Management Agency.

Walsh, C. 2012. Potential for Development of Biennial Winter Canola (*Brassica napus* L.) as a Dual-Purpose Crop in the Pacific Northwest. Master’s Thesis. Plant Science, University of Idaho.

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