PRODUCER PROFILE: Josh Jones

Josh Jones is employing subsoiling and liming to rebuild soil structure on land farmed with conventional techniques for over a century. Here, in a recently subsoiled field, he points out soil compaction problems he is working to solve. All photos by Alex Garland.

Taking a middle road on precision ag and tillage

On his Idaho Palouse farm, Josh Jones is an exemplar of middle-of-the-road practicality.

A dedicated proponent of precision agriculture, Jones provides a model for adoption by the small farmer that does not break the bank. Raising hard red winter wheat, legumes, alfalfa and grass seed on his 1,450-acre spread near Troy, Jones does not use the latest, fanciest equipment to guide precision applications. Instead, he has built a set-up based on aftermarket products that provides high returns for basic investments.

An experienced no-tiller who tried to implement it on his spread, Jones found that sometimes you have to pull back to move forward. He has shifted to minimum tillage on some rotations while he employs liming and subsoiling. The goal is to rebuild soil structure lost in a century of conventional farming, creating a soil compaction layer that hinders penetration of moisture and nutrients. Jones sees soil rebuilding as the only practical course that could allow return to no-till. He continues to use direct seeding techniques on two of three rotations.

Precision ag: a basic approach

The promise of precision agriculture is use of site-specific knowledge to guide variable application of inputs. By avoiding over-use in one place on the field, and under-use in another, precision techniques optimize applications in ways that can manage costs and produce higher-quality harvests. Many tools are available to generate field data and control harvests. The trick is to match equipment to needs in order to gain the greatest return on investment. Jones primarily relies on his combine field monitor.

"I think of myself, when it comes to variable rate, as basic in approach," Jones says. "You can spend as much money as you want. I want the greatest return on investment. Doing what I'm doing is getting me results for very little cost. You don't need new equipment to practice high tech farming. All of my precision farming tools are aftermarket. None came on the machines as stock. You have to take a hands-on approach – know what you need to accomplish your goals. There is a learning curve."

The monitor requires less than $100 in yearly upkeep. "Look at how cheaply I'm generating data. Just nothing."

Jones' variable rate program is based on combine yield maps backed up by extensive soil sampling and tissue testing to assess nutrient uptake and plant health.

"We have dabbled with remote sensing and aerial imagery. My combine maps outperform remote sensing."

Jones as of late 2016 added combine protein mapping, generating far more datapoints per zone than soil sampling. "I am looking forward to utilizing this new data stream to evaluate my current precision fertilization methodology."

An example of gearing investments to return is his auto boom sprayer. The booms are split into five sections that turn on and off as they pass previously applied areas. Jones could gain even more precision with systems that vary applications by individual nozzles. But Jones has calculated that savings do not justify the $30,000 investment on his smaller acreage.

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Jones is liming his fields to deal with an acidity challenge. Traditional timber soils, already tending toward an acidic range, were tipped even further in that direction by nitrogen fertilizers. Jones is seeing improvements in legume yields as a result of liming.

The Idaho farmer also adjusts the degree of precision to the zone. The Jones spread is divided into zones of one to 30 acres. "Is it cost effective to use all management tools in a one-acre zone? Not likely. Potential profit is minimal."

"The number-one question" he is asked is, "Are you saving money on fertilizer?." "I tell people I'm not saving any money on inputs. I'm simply putting them where they deserve to be."

That spells better returns. Applying fertilizer in the right place increases the yield and protein content of wheat crops, thus decreasing discounts at the grain elevator. Putting inputs where they need to be increases grain quality and decreases nutrient runoff because more is being utilized by the crop. "The point is to adjust fertilizer applications to where they will generate the most impact, targeting the best ground for higher applications."

A contrast of soils

When Jones and his wife purchased their Northern Idaho farm in 2008, he already had extensive background in agriculture. His family farmed in southwest Iowa, but lost the place in the early 1980s. When he was four years old, they moved to Montana.

"I always felt drawn to agriculture," says Jones, now in his late thirties. "I had no idea how I was going to get into production farming. But that's what I wanted to do."

Jones stared by leasing 140 acres in the Bozeman area in 2001 even as he gained an agriculture business management degree from Montana State University. He later farmed in Denton near the center of the state. "We decided we needed to own something," so they picked up 1,100 acres near Troy. The remainder of his acreage is leased.

With 11 years of no-till experience in Montana soils, Jones thought he could apply that knowledge in Idaho. But when he started up in Idaho, Jones was warned no-till would not work in his area. It was tried in the 1980s and '90s but failed. "In some ways they were right. There is now zero no-till in area. Mine was the easternmost farm trying it on the Palouse so far as I know. That tells you we're dealing

The Jones spread has older, more weathered soils than in the Montana area where Jones previously farmed. That created challenges which forced him to move away from strictly no-till practices. Here, Jones fertilizes winter wheat.

with something different here."

In Montana soils were "much younger. It was an easy fit. Everything worked." The soil on his Idaho place was older and more weathered – with higher clay content. It tended to be more acidic, at least partially because it was old timber land, probably logged in late 1800s. Nitrogen fertilizer applications over a century of farming sped up acidification exponentially. Conventional farming practices also left a compaction layer around 4-6 inches down, preventing penetration by moisture, nutrients, organic matter or even deep-rooted crops. Jones recounts how canola roots, known for their ability to penetrate soils, would turn 90 degrees when they reached that layer.

Jones thought no-till techniques would solve the soil problems.

"When we came here and started to implement no-till, things went well for a few years. Then we noticed severe compaction issues. There was almost no structure. We stuck with it for five years, but it got worse and worse."

The anaerobic nature of this cold, wet cut-over timber soils created challenges. Around 25 inches of precipitation falls on them annually. Once clay soils are saturated they become wet and compact, and stay that way for a long time. The most challenging compaction issues occur in spring.

"If we don't open the soil a bit, we can be weeks later doing seeding than tilling neighbors," Jones says. While sticking strictly to no-till would retain soil moisture, "Two weeks later on seeding date outweighs moisture savings. Timeliness of seeding is critical, especially in these soils. If we can seed earlier and get more plant growth before the soil dries out, the plant can penetrate deeper into the soil profile, giving access to moisture later in the growing season."

The farm's varied topography "plays in tremendously," Jones says. Flatter land with broad slopes is higher yielding. But 50 feet away can be an eroded clay knob that has to be farmed in a different way. "The problem areas give me fits."

So in recent years, Jones moved away from strict no-till. "We hit the reset button, loosening things up, allowing the soil to be a living entity again."

Restoring soil structure

Jones has adopted a several-point program. He has moved to minimum tillage in some rotations. He is applying lime to reduce acidity. And he has subsoiled his entire spread, tilling at deep layers to break up compaction.

The farm works on a three-year rotation cycle. The wheat rotation is primarily hard red winter varieties. Dark northern spring varieties do not work as well, Jones says, because they require too much nitrogen fertilizer and Jones has difficulty hitting protein targets. This is related to the ability of acidic soils to effectively absorb nutrients. Fertilizer is applied in fall and spring. In spring a cereal crop is planted, typically malt barley. (Due to market conditions he was not been able to grow that crop in 2016.) The spring rotation is followed by a legume, generally chickpeas or garbanzos. Jones has experimented with spring and winter canola, fall rapeseed, Austrian winter peas and sunflowers. He also plants a small amount of grass seed. The winter wheat and legume crops are still direct seeded. The spring cereal is planted with minimum tillage, shanking in fertilizer and seeds. Jones uses vertical tillage instead of horizontal tillage, which by scraping soils sideways creates a compaction layer underneath.

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To break up compaction and reduce soil acidity, Jones is systematically adding lime, working it into the top six inches where most of the problem resides. His soils have an average pH of 5.3, and have reached as low as 4.8. At that level, "you can hardly raise some legume crops." The first application was in 2014. Lime application has helped pulse yields and quality, even under the hot dry conditions of summer 2015. "That actually surprised me." Jones applies lime prior to subsoiling to promote mixing action.

To bring back structure to compacted ground, Jones started subsoiling in 2014 and completed it on all of his fields by 2016. He broke up the soil at a 15-18 inch depth by chiseling it with one shank every 30 inches. The process was followed by planting a deep-rooted crop, such as alfalfa, canola or sunflowers, to help keep soil pores open. He has now traded in his subsoiler to upgrade his former 1994 combine to a 2009 model.

Jones acknowledges that subsoiling releases a significant amount of soil carbon, not ideal, but maintaining economic sustainability requires it. "It's all a balancing act. We've got to start down the road by rebuilding soil structure."

"The loss of soil structure came from 100 years of conventional farming practices. I'm not saying no-till couldn't solve this, just not on my timeline. So I've taken a middle of the road approach."

Jones used an Unverferth Model 130 subsoiler for deep tillage to bring back structure to the soil. The process completed, he has now traded it for a 2009-model combine.

Chad Kruger, who heads up Washington State University's Center for Sustaining Agriculture and Natural Resources, says this is as it should be. "We should not be taking a hardline approach to restrictive practice standards when looking at carbon in ag soils. Such an approach would tie the hands of a producer who needed flexibility to manage given the best knowledge they had for site-specific conditions. One of the reasons for this is this very issue of compaction and the potential that there might need to be occasional deep tillage."

"For me to go back into no-till I am going to have to see evidence we are rebuilding soil structure and organic matter," Jones says.

Notes Jones, "The loss of soil structure came from 100 years of conventional farming practices. I'm not saying no-till couldn't solve this, just not on my timeline. I still have to pay my bills here. So I've taken a middle of the road approach. We're trying to reverse the damage of 100 years. We are not going to do that with five years of no-till. We've already experienced that."

"It's my goal to implement no-till sometime in the future. I had to take a step backwards to do that. My goal is to get soil health back to where it should be, improving my soils during my tenure on the land."

This is part of the REACCH Producer Profiles series funded through Award #2011-68002-30191 from USDA National Institute of Food and Agriculture. It was written by Patrick Mazza of MROC – Mazza Research-Organization-Communication. Mazza can be reached at cascadia2012@gmail.com. REACCH, Regional Approaches to Climate Change, aims to enhance sustainability of Pacific Northwest cereal systems and contribute to climate change mitigation. To find out more about REACCH and farming practices to meet changing conditions, go to www.reacchpna.org.