Douglas Poole with his no-till seed drill. Poole practices no-till in a seven-to-nine-inch rainfall area. All photos by Alex Garland

Making no-till work in a low-moisture area

They told Douglas Poole he couldn't do it. North Douglas County was not the place for no-till agriculture. Between its sandy loam soils and its Cascades rain shadow precipitation, one of the lowest in Washington state, you just couldn't make a go of it.

"Everybody said you couldn't do no-till here because you couldn't get the moisture," Poole says. But he was not swayed. "We didn't believe someone when they said it wouldn't work."

Poole was going up not only against received wisdom, but his family's own experience. His father tried to implement no-till 30 years ago and failed.

Today, he and 10 other nearby producers in the Dyer Hill area near Mansfield are proving that no-till can work effectively in extremely dry zones. As of 2016, the Poole family's cultivated acreage was entirely in no-till, including his dad's land. Only around 1,000 conventionally tilled acres remain in the immediate area. Poole is also demonstrating that the practice opens doors for crop rotations and crop diversification that improve farm economics in significant ways.

"The tide's turning," Poole says. With no-till's superior capacity to soak in precipitation, "We have just as much moisture as anyone else, if not more."

Poole's "third rotation"

Poole actually walked in the steps of his uncle, the original of the four local producers employing the practice. "The godfather," he quips. "Everyone thought he was a nut case." Now he's on his fifth rotation. Poole has reached his fourth.

"If I could stress anything, it took four or five of us. One of us could not have done it by ourselves. I wouldn't be where I am today without my uncle."

Along with his father and uncle, Poole farms 11,000 dryland acres with a typical annual precipitation of seven-to-nine inches. The operation also runs cattle on another 10,000 acres. The main crops are soft white wheat in winter and spring rotations for the export market. No-till is also allowing diversification into canola and sunflowers.

Typically half of the cultivated land is in fallow. Chem fallow is employed, but Poole aims to move entirely away from fallowing over the next decade with cover cropping. He is one of the region's early adopters of cover crops. The operation also makes use of biosolids, which the Poole family pioneered in Douglas County.

This is Poole's own "third rotation," coming back to farming after a couple of previous stints. His first was growing up on the farm. His second was in the 1990s. But a combination of low prices and insufficient acreage drove him out in 2001. In 2010 he returned after 20 years working on school finance for the North Central Educational Service District in Wenatchee. Supported by Natural Resources Conservation Service (NRCS) incentives, he moved into no-till in 2012.

No-till is characterized by minimal soil disturbance. Instead of planting seed in furrows cut into the ground, the practice employs a drill. The NRCS EQIP program enabled Poole to buy his first drill in 2012. It was one of the original NRCS Energy Incentive grants, reflecting the no-till advantage of fewer tractor passes required in no-till. The grant also supported cover cropping and crop rotations. A 2015 grant under the NRCS Air Quality initiative has now enabled full no-till conversion of the Poole spread.

"It changed how I farm," Poole says "I get more Saturdays now." He estimates he spends only a tenth of the time on the tractor as he once did. But he also spends more time researching.

"You've got to be willing to study and change," and even "lose sleep" over questions such as the best choice of seed drill. "There are endless options."

Poole's points out crop residue retention, a key to rebuilding soil health and fertility.

One large no-till challenge is upfront investment costs of conversion. EQIP helped, but Poole had to put substantial capital in as well. Poole places the cost of his two drills at $225,000.

"The investment has to be made. You make up on yields, and save on fuel."

The problem often is selling the proposition to the banker.

"There's a comfort in just doing what you've always done."

Restoring soil health

The central value of no-till is rebuilding soil organic matter, which long-term conventional farming has sharply depleted. Organic matter acts like glue, holding water and nutrients in the soil, and binding the soil against erosive buffeting by wind and rainfall.

"We want the stubble and residue to stay. What little grow we get, we want to catch it." Walking through a field, Poole kicks at residue to show its depth. "That's what I like."

"We beat this soil for 100 years," Poole says. "I feel like I'm getting the soil live again . . . Our dream is to get earthworms, to show the soil is healthy."

Poole is fighting the legacies of the past, when erosion "dragged dirt off ridges." It has stark impacts on production. His combine monitors record 10 bushels per acre along some of the depleted ridgelines, contrasted with 90 on some of the bottom lands.

Poole recounted a recent downpour, one inch in something like 40 minutes, which left a no-till hill on his land undisturbed while precipitation penetrated three inches into his soil. The same rainfall left small lakes in surrounding areas and washed soil off a nearby producer's hill. "It was a real eye-opener to a lot of guys."

He can also recall several blustery wind events in which he could not see his shop from his house just a few yards away. It reminded Poole of the 1930s

"If I could stress anything, it took four or five of us. One of us could not have done it by ourselves. I wouldn't be where I am today without my uncle."

"We are able to do things other guys can't because we are able to retain moisture," Poole says. "It is fascinating. As we move into no-till, the doors that open are endless."

Dust Bowl. "It's going to look that way if guys don't start converting," he says. "It's well known that you don't see our hill blow anymore."

Conventional tillage cuts deep into soils, furrowing for planting and disking passes to keep weeds down ranging from five to seven times a season. Soils are "pulverized" by the time the season is done, Poole says. He employs a hoe drill that leaves hardly any disturbance. A look at one of his fields shows the lightest of impressions on the soil. He lays fertilizer and seed down in the same pass, with seed at around a one-inch level and fertilizer two inches below it.

The improved soil health on the Poole spread has opened the way for crop diversification, which provides a hedge against low wheat prices.

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Diversifying to new crops

One of those open doors is cultivation of canola, which Poole describes as "finicky." Poole plants around 1,100 acres in rotation with wheat.

The 2013 opening of the Pacific Coast Canola crusher at Warden, Washington has made a market for this oilseed crop, which is sold as high-value food oil, and as a biofuel feedstock. Crushing also produces high-protein meal for animal feed, an added value in a region that has to import much of this product. Prices on canola have varied, and along with them canola production in Washington state. In 2013, peak acreage was 61,200 acres, while in 2015 that figure was down to 37,400.[1]

Whatever the price, Poole intends to keep canola in rotation. In fact, he aims to set up rotations so winter wheat will never be repeated on the same field three times in a row.

"I am a believer in crop rotations and what canola can do," Poole says.

Canola breaks up pest and disease cycles, cleans up weeds such as goat grass, and improves soil fertility by diversifying root structures. The outcome is significantly increased wheat yields on the next rotation. Poole says canola improves per-acre yields 15-20 bushels over neighboring farmers, and even in dry years, 10.

Another crop diversification strategy employed on the Poole place is sunflowers for bird seed.

"The guy who sold seed was skeptical due to our seven-inch rainfall." But a crop grown in 2015's extraordinarily dry conditions yielded plants six-to-eight-feet tall "just on accumulated moisture."

An additional attraction of the sunflower crop is its capacity to break up hardpan. Poole deals with a four-to-five-inch layer on some of his land, and this prevents nutrients from penetrating.

Trying out cover crops

With soil moisture, cover crops are also possible. Poole is one of the region's advanced explorers in dryland cover cropping, employing them as an alternative to chem fallow.

"Cover crops are new out here," Poole says "They are used back east to dry out fields."

Cover crops are intended not for market, but to build soil health. As of 2016, Poole has implemented covers on over 2,000 acres. In spring, Poole plants sunflowers, millet, sorghum and red clover, a nitrogen fixer. Summer cover crops are oats and sorghum. Poole is finding success with fall cover crops that include winter triticale, peas, radishes, oats and canola.

A concern about dryland cover cropping is the impact on moisture retention. Typically cover crops have been planted in regions with strong summer precipitation, a contrast with the drier summers of the Northwest. The REACCH Project has supported the Okanogan Conservation District to conduct dryland trials.

"Cover crops have been utilized extensively in the Midwest and the eastern U.S., where summer precipitation is prevalent," notes Leslie Michel of the Okanogan Conservation District. "Growers in the Pacific Northwest have become aware of these benefits and are curious as to whether cover crops are beneficial in our winter precipitation climate. Rainfall patterns in Eastern Washington differ vastly from those in the Midwest and East."[2]

Poole is "hot on cover crops because you can rebuild the soil with organic matter." Cover crop roots bio-till and fertilize the soil. "We let the variation and

Poole's system supports diversification to sunflowers and other crops.

diversity of roots do tillage for us." Do the math, Poole says. If fertilizer costs $50 per acre, and he can cut that in half with cover cropping, it makes the business case. And he finds the practice can actually increase soil moisture, allaying concerns whether cover cropping can work in dryland conditions.

By pushing out weeds, cover crops reduce the need to spray herbicides. He contrasts an $8.50-$9.00/acre spray cost with an equivalent of $7.00/acre for cover crops. He aims to reduce and eventually eliminate spraying and completely phase out fallow over the next decade. "No-till gives us an opportunity to look at crop rotation rather than another chemical."

"The big question now is the best combination and timing of cover crops."

Besides saving on spray, cover crops provide an additional value proposition, fodder for the cattle on the Poole spread. Cover cropping farmers can also sell seed to each other.

Pioneering biosolids applications

Biosolids applications dovetail with cover crops to build soil carbon and fertility. Poole spreads biosolids ahead of the seed drill, which then pushes them into the soil, retaining nutrients longer. Applications must be limited though. Because biosolids are so nutrient-rich they can burn crops.

Poole and his family pioneered use of biosolids in their area. Back in 1992, on his second tour on the farm, he along with his dad and several neighbors formed Boulder Park Inc., now the nation's largest farmer-owned biosolids cooperative.[3] The name derives from the area's rocky soils, a heritage of the ice age floods. Biosolids are a product of municipal sewage treatment that is thoroughly processed to remove contaminants and pathogens. Boulder Park now draws biosolids from 32 sources to serve 130 producers managing 75,000 acres in Douglas County. The company provides regular testing to make sure safety standards are met.

"Every time we turn around, there's something new. It's like spokes in a wheel. We can't get at all of them. We are on a learning curve to figure out how to put them all together."

Applied over time, biosolids build soil carbon and nitrogen, making it available to plants in ways that are superior to inorganic nitrogen fertilizer. Washington State University soil scientists have extensively studied the results on a test plot at the Poole farm, finding wheat crop yields with better germination and survival, and lower soil erosion. Improved crop density increases moisture retention and reduces weeds, which in turn cuts herbicide use. The combination of no-till and biosolids application build soil organic matter, carbon and nitrogen. Around 70% of carbon and 35% of nitrogen in the original application remain in the soil. The lower nitrogen figure reflects uptake in wheat crops.[4]

The Poole operation employs a three-zone application for precision fertilizer application for commercial fertilizer, though it is more challenging for biosolids applications, he says.

Poole carefully targets chemical applications. His sprayers use automatic guidance to direct spray application in blocks of 10-by-10 feet. The Pooles found when they added guidance a few years back that some areas had been oversprayed by 30-35%. "That's money … We are getting better at spraying, using less."

Between no-till, cover cropping, diversification to crops such as canola and sunflowers, precision agriculture and biosolids applications, the Poole farm is an exemplar of agricultural innovation. Poole believes he is only at the early stages of exploring the synergies.

"Every time we turn around, there's something new. It's like spokes in a wheel. We can't get at all of them. We are on a learning curve to figure out how to put them all together." ■

END NOTES

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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.