



PRODUCER PROFILE: John Aeschliman



John Aeschliman has been restoring soil life since the 1970s with no-till practices. The ground now is filled with earthworms. Here, Aeschliman points out how worms aerate and fertilize the soil. All photos by Alex Garland.

No-till pioneer still exploring new frontiers

JOHAN AESCHLIMAN STANDS ON A ROAD ABOVE A STEEPLY sloped bowl covered with a recently planted winter wheat crop. He recounts the long history the scene represents,

and calls to the future it embodies. Aeschliman was one of the earliest no-till innovators on the Palouse, and he is still at it, expanding the boundaries of what no-till can do for health of the soil and the family farm.

“I was there in the beginning of no-till,” he says.

When his grandfather first ran a moldboard plow over those slopes in the 1880s, he broke the ground as farmers had been doing for thousands of years. Today, Aeschliman and his son, Cory, rip the ground no more. Instead they drill seeds and fertilizer directly into the soil.

“We’ve become some of the oldest no-tillers anywhere,” says the Whitman County farmer. “Direct seeding is revolutionizing agriculture as we know it. It has in my lifetime.”

“I embrace change,” he adds.

Since their earliest ventures into no-till in the mid-1970s, the Aeschlimans have accomplished agronomic feats on their Colfax, Washington-area spread that skeptics said could not be done. They have brought no-till to steep ground. In a 15-20-inch rainfall area where corn is almost never raised without irrigation, they can grow corn on dryland because no-till has built up a deep moisture column in the soil. Now they are pushing a new envelope, learning how to transition USDA conservation program land planted in grasses directly to high-yielding wheat crops with no tillage or field burning. And without the disease problems often associated with such a transition. The Aeschliman operation is now an internationally recognized model, and has hosted up to 20 tours per year.

Literally the groundwork of the Aeschlimans’ success is a restoration of soil life, microorganisms and earthworms that fertilize the soil and build its structure, improving its capacity to absorb and hold moisture.

“Soil life makes this system work,” Aeschliman says. “Pay attention to how nature works.”

The roots of no-till

NOW IN HIS LATE 70S, AESCHLIMAN remembers how spring seasons of his youth brought an unwelcome visitor to the family farmhouse.

"When I was growing up, erosion was draining mud everywhere," Aeschliman says. "Every spring the mud was running around the house."

The family farm was small, only a 320-acre half section. So Aeschliman moved away from full-time farming for some time and started his own business manufacturing institutional furniture. Farming was in his blood, though. With his father moving into retirement, he opted to return to full-time farming in the mid-1970s. But, recalling those muddy springs, he knew something had to change.

"As I began to think about coming back to farming, I thought, this is nuts. There's got to be something better."

A few pioneers were showing the way. Another local farmer named Morton Swanson had built a strange, contraption "big as a boxcar" in the late 1960s. It was the first no-till seed drill in the area. "Everyone looked at Mort and said, 'What's going on?'" Aeschliman recalls. Other farmers were also beginning to direct seed. Aeschliman calls out Winston Mader and John Rae.

"That was the beginnings of where everything took off in Whitman County," he says. "Farmers were figuring stuff out."

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These guys were big farmers. I was just a little half-section."

But, nonetheless, with their advice, he began to experiment with no-till in 1974. "It worked. That was the beginning." By 1976, when he was fully back on the farm, he was committed to the direct seed path. The early years were trial and error, dealing with weed blow-ups and disease issues, and trying to understand the best drill technology and best varieties of wheat to grow in the system.

"Direct seeding has come a long way since those days," the farmer says.

No-tilling on steep ground

DRIVING BETWEEN DIFFERENT PARTS of his ground, Aeschliman points to erosion ditches on the steep terrain around his place. A steep ridge of soil on a fence row, ranging up to 30-feet high, shows how the soil has moved. "That tells the story. The guy on top keeps plowing down towards the fence. The guy on bottom keeps plowing down away from the fence and the bank keeps getting higher each year. All done by moldboard plow. They did not know any better. After 100 years of plowing, we know better now."

But if he had listened to the skeptics, his own land might look that way.

"We have really steep ground. That's why they said it wouldn't work. We said, baloney, it will work." Aeschliman makes that point by showing a picture a 60% grade winter wheat field, some of the most angled soil on his place. After seven years of no-till no ditches are showing.

The Aeshlimans have proven that no-till works on the steep slopes of the Palouse with four decades of successful growth. By 1980 they had expanded his operation to over 1,100 acres, and now farm seven parcels on around 4,000 acres.

"They say no-till doesn't work, but I paid for all that land with it," Aeschliman says. "We just keep expanding."

"We very seldom have a poor yield," he adds – Even in the dry summer of 2015, yields were only down 10-15%.

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"You have to see the advantages. If you get convinced, it will work."

The Aeschlimans' ground is spread across three rainfall regimes, 18-20 inches around the original farm, 15-18 inches one mile west as crow flies and 10-14 inches 12-to-14 miles west. The increased capacity of the no-tilled soils to absorb precipitation provides the equivalent of 2-4 inches additional rainfall and builds moisture reserves 6-8 feet deep in the ground, Aeschliman estimates. The test is heavy downpours. "Not a drop runs out of our fields. No water leaves the ranch anymore. I've been doing this for 45 years. It never rained hard enough to wash. There are no ditches. The ground is smooth and beautiful."

The area is summer fallow. Typical rotations are winter wheat-spring barley-spring wheat-legumes in higher rainfall areas. In areas with less precipitation, a rotation might be winter wheat-spring barley, then a year of chem fallow. Typical yields are as follows:

	Winter wheat bushels/acre	Spring wheat bushels/acre
Low rainfall	65-85	45-55
Medium rainfall	75-100	50-65
High rainfall	85-110	55-75

The farm rotates canola in between spring and winter wheat. Another rotation meshes canola in between two winter wheat crops, with the second followed by corn. The Aeschlimans are also trying out sunflowers. With new oilseed crushing capacity in the state at Warden, there is greater interest in the oilseed crops.

The Aeschlimans drill seed directly into stubble left by winter and spring cereal crops, as well as into chem fallow residue. Between each row of seeds, a liquid urea fertilizer band is injected. Applications are variable rate based on combine monitor data. Potash, phosphate, chloride, boron and zinc are applied along with liquid urea in the dead band between the seed rows. The Aeschlimans avoid fertilizers such as anhydrous ammonia because of their toxic effects on earthworms and microorganisms. To reduce soil acidity, they are experimenting applying prilled lime in the seed row.

Into the 1980s, Aeschliman tried out a number of drills on a rental basis. He purchased his own drill in 1990 and has had a number since. Today the farm uses a Cross Slot drill on a Flexi-Coil 6000 frame that leaves slight indents in the soil. The profile resembles two Ls, one on either side of a notched center blade. "The beauty is it doesn't tear the soil up. There's nothing with less disturbance than a Cross Slot drill. Disturbance is our enemy."

A huge economic and environmental advantage is reduced tractor passes. Conventional tillage could require up to 10 tractor passes. Now typically that is cut down to two spray passes and one seeding pass, with fertilizer applied on the seeding run. That reduces fuel use significantly, and cuts labor needs on the farm to three, John, Cory and an employee.

The residue and weed learning curve

LEAVING RESIDUE ON THE GROUND IS A key strategy. It reduces erosion and builds nitrogen, shaving fertilizer costs. Where the guideline for 100 bushels hard red winter wheat is 250 pounds nitrogen, the Aeschlimans might use around 100. The guideline for dark northern wheat spring wheat is 180 pounds per 60 bushels. They use around 100-120. Soil testing indicates that nitrogen levels are being maintained by residue input.

Leaving residue on the ground is a key strategy. It reduces erosion and builds nitrogen, shaving fertilizer costs.

The Aeschlimans' weed control learning curve began with subsequent winter rotations in the early days. But spring brought goat grass and downy brome. So they began spring cropping, typically preceded by a spray. They have learned to "break the green bridge." The concept, developed by R. James Cook, a USDA plant pathologist based at Washington State University, eliminates weeds and volunteer plants for a period before planting.¹ The Aeschlimans allow a three-week period. They typically spray in fall as well.

In the early days, they let straw and chaff bunch up behind the combine. That made a habitat for disease. Now chaff spreaders on combines even out the residue layer, so sprays will evenly reach weed and volunteer seeds and eliminate pathogens.

Residue has an additional environmental benefit. It feeds the wildlife food chain. Aeschliman says his land is "like a game reserve," with deer, elk, moose, hawks, owls, and an occasional eagle.

The Aeschlimans are experimenting with cover crops including tillage radish and crimson clover as an alternative to chem fallow. Cover crops help build soil fertility and reduce opportunities for weeds, pathogens and pests. They have been popular in areas with high summer precipitation, but moisture retention in low summer rainfall regions has been an issue. "We're just playing with it," Aeschliman says.

Altogether, the Aeschlimans' soil building practices, from residue management to encouraging soil life, have raised soil organic matter. Some of the original prairie grasses contained 1.5-3% organic matter when the soil was first plowed in the 1880s, but became depleted over the years. Now organic content has roughly doubled to 3.5-5% on much of the land, providing huge advantages for moisture retention, fertility and pathogen management.

Raising corn on dryland

THE DEEP MOISTURE COLUMN AND vibrant soil life created by long-term no-till practices has given the Aeschliman farm a rare capacity to grow corn on dryland in a 15-20-inch rainfall area.

"They said you couldn't raise corn here," Aeschliman notes. "There is not a lot of dryland corn around. Most is irrigated."

The corn ground has been continuously cropped for 20 years. Aeschliman began experimenting with the crop around 1997. Yields rapidly moved up from 90 to 135 bushels/acre, and performance in the 120-160 bushel/acre range is now common. Even 200 bushel/acre yields have shown up on combine monitors. Even on top of hills, yields per acre can be around 100 bushels, something Midwest farmers who've visited the Aeschliman place say they cannot do. In the National Corn Growers Association Corn Yield Contest, the Aeschlimans have won Washington State yield champion in the no-till/strip till, non-irrigated class many times, including 2015.

The crop feeds cattle. Silage with 37%

"There is not a lot of dryland corn around. Most is irrigated."



Few farmers can grow corn in the interior Northwest's dry climate without irrigation. John Aeschliman can, because his no-tilled fields have accumulated a deep moisture column.

dry matter averages 10-15 tons/acre depending on the year, and can run as high as 20-25 tons/acre.

Harvesting leaves cobs on ground. Action by earthworms works them into soils typically over a four-year period. Worms also digest roots. All this builds soil fertility. Aeschliman pulls up a clump of soil where a root structure had been and finds dark soil. "See, that's all worm poop."

Walking into one of his corn fields, he puts a shovel into the ground. "This is 40 years of no-till. You can dig in it. It would be hard as the road if it was not no-till."

Direct seeding into conservation lands

ONE OF THE AESCHLIMANS' LATEST innovations is taking out USDA Conservation Reserve Program (CRP) land with direct seeding, a practice that saves soil carbon lost in the common practice of tilling and field burning lands going out of CRP.

"It's been a tremendous success," Aeschliman says. "We're not disturbing

the root activity and all the carbon that's sequestered."

He adds, "After three years the soil is still absorbing all the rainfall with no visible erosion, the root channels and soil profile are all in tack with signs of soil life, and earthworms are beginning to return."

Seeing other farmers transition lands from CRP, "It just breaks my heart to see neighbors disking or burning. People don't know you can do this," the farmer notes.

"Taking CRP out with a plow is a travesty. You lose all the stuff you've built up," he adds. "Everyone thinks you need to break this up. That's old technology."

The first winter wheat crop yielded 85 bushels per acre "right out of sod, which is unheard of."

We have drills now that can seed directly through all the roots and root balls and leave the residue like a big horse blanket to protect growing plants from winter kill, hold moisture during a dry season, and stop erosion."

Viewing a converted CRP tract, Aeschliman points to the residue cover: "See how that's all tied together. There it lays sealing the ground. That will never wash because we haven't disturbed the root structure. We just injected seed and fertilizer in it."

The CRP program aims to rebuild soils. But farmers worried about pathogens remaining in the sod have felt compelled to burn and/or till. Instead, Aeschliman employs a herbicide to "break the green bridge and burn down the plant." Allowing three weeks before planting tends to eliminate any disease problems, he says.

CRP provides farmers have 10-year contracts to grow soil-building crops such as grasses. After a contract on an 850-acre CRP tract was up in fall 2014, Aeschliman direct seeded the field. He planted winter canola and wheat directly into the grass sod. The first winter wheat crop yielded 85 bushels per acre "right out of sod, which is unheard of." The winter canola crop produced 2,300 pounds per acre. He planted spring wheat into the stubble and harvested 50 bushels per acre.

"Nobody gets 50 bushels here," Aeschliman says. "We were pretty tickled. People feel lucky to get 20 bushels here."

In this 11-13-inch annual rainfall area, "yields were almost the same as our higher rainfall areas that are annual cropped and not chem fallowed," Aeschliman says.

Since 2014, Aeschliman has converted 250- and 20-acre CRP tracts using the same techniques.

"This is the kind of stuff that really gets me pumped," he says. "I could plant corn in here if I wanted."



"Earthworms are nature's plow. You've got to provide the environment for these guys to live. They will make you so much money you won't believe it."

Partnering with soil life

THE AESCHLIMANS RELY ON PARTNERSHIPS to make their operation work. Some of their most important partners are invisible to the unaided human eye, the microorganisms that infuse healthy soils. To drive home the point, Aeschliman notes, "One teaspoon of healthy soil has more microorganisms than there are people on Earth. We still don't know what they all do."

One important understanding only gained in recent years is how mycorrhizal networks bind the soil together. Soil scientists have found that these networks of fungi, which exchange water, minerals and nutrients between soil and plant roots, also produce a carbon-rich substance called glomalin, a kind of soil glue. Aeschliman recounts a demonstration in which clods of no-till and conventionally farmed soil were placed on screens at the top of two beakers of water. The conventional soil dissolved. The no-till soil remained solid. One reason is that long-term no-till soil is filled with soil life including mycorrhizae which produces

glomalin. This soil glue absorbs moisture and holds the soil together.

This binding effect is a key reason why no-till soils are resistant to erosion. But conventional farming management practices break up mycorrhizal Hyphae networks. To these tiny creatures, tillage and field burning are "an earthquake followed by fire," Aeschliman says. "Fields are tilled to death, with hardly anything alive."

"This stuff is all renewable," Aeschliman notes. "We just have to renew it. Are you being a good steward of the soil? If that means stop plowing, stop plowing. If that means stop burning, stop burning. Pay attention to the soil. Think of it as living thing, not dirt."

Adds the veteran no-tiller, "You've got to understand the soil and the animals that make it. You just park some of

your equipment when you see what it does to the soil."

Working with "nature's plow"

AMONG THOSE ANIMALS ARE THE earthworms that penetrate living soils.

"Earthworms are nature's plow," Aeschliman says. Worms constantly process that layer of soil where roots and microorganisms interact. "They will change the whole rhizosphere for you. You've got to provide the environment for these guys to live. They will make you so much money you won't believe it."

Climbing down into a soil pit Aeschliman has dug to demonstrate that point, the no-till advocate points to dark lines, "the worm castings, all that dark squiggly stuff," in the yellow clay ground. "See all the black. That's pure plant food," supplying nitrogen to the soil. He points to the pores. "Those are all worm holes. That stuff is just totally permeated by worms. The worms are changing that yellow clay to black earth. They change the profile of the soil."

Earthworms transport carbon and nutrients from organic residue on the surface down into the ground. "Worms work stubble all year. You are sequestering carbon by not tilling."

Soil pores opened by earthworms play a crucial role in building the soil's moisture column. The ground is "totally aerated by worms. That's what you want. That's the way the water and the oxygen go in when it rains. The ground sucks the water up. You lose all that when you till it. You destroy the structure of the soil, its ability to uptake moisture."

"It has been said that if you have 21 earthworms per square foot, you have one ton of earthworms per acre,"

Soil organic matter content has roughly doubled to 3.5-5% on much of the land, providing huge advantages for moisture retention, fertility and pathogen management.

Aeschliman notes. “That one ton of earthworms will produce three-quarters of an inch of nutrient-rich castings on that acre per year. And the macro pore equivalent of one ton of earth worms in that year is equal to 4,000 lineal feet of six-inch drain tile.”

It is uncertain whether all Northwest farmers can gain these benefits. A survey done for the REACCH project did not find earthworms in soils with mean annual precipitation under 13 inches. “The data suggest that while earthworms are largely absent from the driest sites, they can achieve relatively high density and biomass values when local conditions (soil properties and management) are favorable,” concluded researchers C.L. Walsh and J.L. Johnson-Maynard.²

Travelling to another part of the farm only acquired in 2003, Aeschliman uses a soil probe to show the rebuilding effect of no-till. “This ground was just trashed when we bought it. It’s taken years to recover.”

He pushes the probe down into soil. It is his first time doing that on this particular piece of ground. Around two feet he hits a hard spot. “If I do this at home I can push down six feet. That’s probably the plow pan.” Once the layer is penetrated, it’s easy going. “That’s how it should be.”

Aeschliman pulls up a core sample. “Look at the worm castings. That’s cool stuff. This place had no worms when we took it over.” A second probe on a higher part of the ground also turns up worms, even at the end of a hot summer. “I’m surprised there’s that many. That’s pretty stinking good.” The soil is darkest in the first foot, and becomes lighter each subsequent foot. But worm castings still appear six feet down. “To find worms here, that’s good. If you provide the environment they will come.” He adds, “Twenty years from now I guarantee there will be more activity going on.”

“Soil life is where it’s at,” Aeschliman says. “When you stop tilling nature takes its course. It gets better every year you

Read more about the Aeschliman farm and no-till:

Ellen B. Mallory et al, *Direct Seeding in the Pacific Northwest*; Aeschliman Farm Case Study, Pacific Northwest Extension Publications, 1999, http://pnwsteep.wsu.edu/dscases/ext_pubs/pnw0515.pdf

John Aeschliman and Ron Ross, *What I’ve Learned From No Tilling: Do More With Less!*, No-Till Farmer, Oct. 1, 2002, <https://www.no-tillfarmer.com/authors/208-john-aeschliman>

Candace Pollock and Randall Reeder, *No-Till: Plenty of Positives*, No-Till Farmer, February 15, 2010, <https://www.no-tillfarmer.com/articles/1012-plenty-of-positives-with-no-till-system>

David R. Huggins and John P. Reganold, *No-Till: The Quiet Revolution*, *Scientific American*, July 2008, https://www.researchgate.net/publication/5228398_No-Till_The_Quiet_Revolution

Climate Solutions, *The Second Solution: Agriculture’s Role* (video), <https://www.climatesolutions.org/programs/nbi/soil-building-agriculture>

do it. It’s very forgiving soil. It just comes from treating soil as a living thing.”

Moving into no-till: some advice

AESCHLIMAN ADVISES THAT FARMERS move into no-till in a phased manner, starting on 50–100 acres of their best ground and paying attention to soil quality. Begin with used drills to keep the cost lower. There are many on the market, he says.

Recalling his own experience learning from some of the original no tillers, Aeschliman strongly suggests working with an experienced direct seeder, even hire them to seed for you in early years.

Picking the right time to start is important. In the Palouse, the ideal time to start in is spring, after a winter wheat rotation and a spray to take down the “green bridge.” A spring wheat or barley,

or legume is a suggested rotation, with fall planting directly into the residue.

Be patient, Aeschliman advises. It will take around four to five years for soils to rebuild their life and regenerate themselves.

“We spent a lifetime learning this,” Aeschliman says. “We’re never going to go back,” ■

Endnotes

1 Roger Veseth, “Green Bridge” Key to Root Disease Control, Pacific Northwest Conservation Tillage Handbook Series, Chapter 4 – Disease Control, No. 16, July 1992

2 Walsh, C.L and J.L. Johnson-Maynard. 2016. Earthworm distribution and density across a climatic gradient within the Inland Pacific Northwest cereal production region. *Applied Soil Ecology* 104:104-110

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