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STRIP-TILLED AND DIRECT-SEEDED VEGETABLES INTEGRATED WITH CATTLE GRAZING: ERIC WILLIAMSON

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STRIP-TILLED AND DIRECT-SEEDED VEGETABLES INTEGRATED WITH CATTLE GRAZING: ERIC WILLIAMSON

By
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Abstract

Eric Williamson raises cattle, vegetables for processing, and grain crops near George, Washington. In this publication, Williamson discusses how strip-tillage and direct-seeding have greatly reduced erosion, lowered costs, and allowed the farm to double crop at some points in their rotation, growing two back-to-back crops during a single growing season. Meanwhile, integrating beef cattle production into the farm has improved soil health and the farm's bottom line.

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 clarity, without changing the meaning.

Readers interested in other case studies in this series can access them on the REACCH website as well as in the WSU Extension Learning Library.

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Photo: Darrell Kilgore.

Location: near George, WA

Average Annual Precipitation: 8 inches (crops are raised under irrigation)

Cropping System: Diversified vegetable sequences, with sweet corn, green peas, lima beans, bell peppers, edamame, canola, wheat, and triticale. On a rotational basis, he leases ground to other farmers for growing potatoes. The operation also provides backgrounding for cattle.

Watch the companion video, [Strip-tilled and Direct-seeded Vegetables Integrated with Cattle Grazing: Farmer-to-Farmer Case Study Series], introducing Williamson, his production system, and his experience with strip-tillage and livestock production.

Map: Kaelin Hamel-Rieken, Washington State University.

Introduction

Eric Williamson is a fourth-generation farmer who grows irrigated vegetables with his family just south of George, WA, in the Columbia River Basin. The Williamson family produces many types of processing vegetables, in diversified cropping sequences that include sweet corn, green peas, lima beans, bell peppers, edamame, wheat, triticale, and some seed crops. The farm also rents ground, on a rotational basis, to a neighbor who grows potatoes. Irrigation water supplied from a combination of deep and shallow wells and from the Columbia Basin Irrigation Project is applied using center pivot irrigation systems.

Quincy fine sand and Timmerman loamy sand are the main soil types on the farm (Gentry 1984). Although these soils are suitable for growing vegetable crops, their low organic matter content and limited water holding capacity make them highly susceptible to wind erosion. They are especially vulnerable during wind events that occur in spring and fall. To reduce the risk of wind erosion, Williamson focuses on protecting the soil by using strip-tillage, direct-seeding, and amending with aged manure. He also integrates beef cattle on the farm, which allows him to graze crop residue and diversify his markets.

Adopting Strip-Tillage to Reduce Soil Erosion

In the past, Williamson needed to wet the soil surface with irrigation water before high wind events because conventional tillage practices remove most crop residues, leaving the soil susceptible to loss from wind erosion. This reactive strategy was labor intensive, costly, and not always effective. “It was really challenging to keep the water running and try to keep soil from blowing. In winds much over 30 miles an hour, no matter how much water you applied you couldn’t keep the soil from blowing.” The extra watering also leached nitrogen and herbicides below the effective rooting zone, reducing the efficacy of these agricultural chemicals, negatively impacting water quality, and increasing pumping costs.

Windblown sand particles could also damage or completely destroy emerging crops in the spring. “Sand is very abrasive, so when it blows you can oftentimes lose your stand.” Even when possible, replanting was expensive, required extra work, and delayed the harvesting schedule for the processor.

Seeking more effective strategies to reduce wind erosion, the Williamsons first tried using strip-tillage in 2000, adding direct-seeding for green peas and grains in 2005.

Current System

High Residue Farming Across the Rotation

The Williamsons use strip-tillage on the majority of their 4500 acres, with some important exceptions. Direct-seeding is used to plant grain crops and green peas. Vegetable transplants, such as green peppers, are planted directly into tilled soil, while potatoes require extensive tillage—at planting, to ensure loose soil for tuber development, at harvest, and again after harvest to re-level the field.

The strip-till system creates clean-till conditions in the planted row and leaves residue between rows. Soil in the tilled planting strip warms more quickly than soil covered with residue—similar to fully tilled soils. The system thus combines the advantages of tillage (within rows) with the advantages of leaving residues (between the rows). See the *Strip-Tillage* sidebar for more information.

Williamson uses direct-seeded winter and spring wheat (mostly dark northern spring and soft white) in three distinct ways: as a forage crop that is grazed in the winter or spring by cattle (Figure 1), as a forage crop that is cut in the late spring for hay or silage, or occasionally, as a harvested grain crop. In all these cases, growing wheat also serves to reduce soil erosion.

Because he is interested in preserving flexibility to harvest the wheat as a main crop, Williamson always plants a treated wheat seed, sown with the same level of care he would use for a grain crop, even when planning to use wheat for grazing or silage.

Figure 1. Cattle grazing a wheat cover crop in October 2015. Photo: Darrell Kilgore.

Williamson also plants winter forage triticale for grazing. Forage triticale seed is relatively expensive compared to other cereals that could be sown. However, it provides nearly twice as much dry matter as wheat when planted by mid to late August. It is also more palatable than wheat forage, producing excellent quality grazing forage, and good quality silage.

Though cropping sequences vary, one of Williamson’s common sequences is to plant winter wheat in the fall after digging potatoes. With an early fall planting, wheat can be tall enough to control wind erosion in the early spring. A few weeks prior to spring planting, the wheat cover crop is killed with an herbicide and green peas are drilled directly into the protective wheat residue. Green peas are harvested relatively early in the season (normally June). Sweet corn is then planted into the pea residue (Figure 3) in a single pass field strip-till and plant operation in which the strip-tiller and planter are connected. Sweet corn is followed by winter wheat planted in the fall.

Strip-Tillage

Karen Hills, Center for Sustaining Agriculture and Natural Resources, Washington State University; and Andrew McGuire, Washington State University

In strip-till systems, the soil is tilled, and residue is either removed or buried in 6- to 12-inch wide strips where the crop is planted (Figure 2), with planting done either in the same pass or in a separate planting pass. Residue is left undisturbed in the area between these strips (McGuire 2014a).

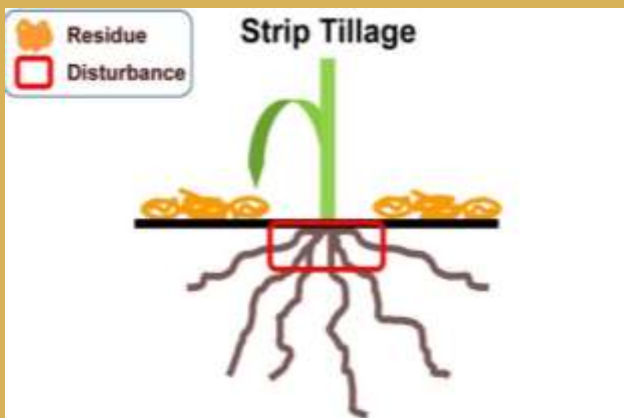

Figure 2. In strip-tillage systems, soil disturbance only occurs in the planting strips, with residue left between these strips. Figure: Williams et al. 2016.

Benefits of *tillage* provided by strip-tillage

- Warmer soils.
- Easier planting into seedbed with loose soil and little or no residue cover.
- Faster germination and early crop growth.
- More options for fertilizer placement.
- Alleviates surface compaction in planting strip.

Benefits of *no-till* provided by strip-tillage

- Residue left on the soil provides physical protection from wind erosion and surface crusting.
- Increased surface organic matter.
- Increased water infiltration.
- Reduced evaporation.
- Reduced time and labor needs for tillage operations.
- Improved soil quality.
- Reduced soil compaction.
- Livestock integration.

Figure 3. With warm temperatures and irrigation, green pea residue is not visible in the corn crop by the end of the season. This photo was taken in October 2015. Photo: Darrell Kilgore.

The cropping sequence then includes one or two years of a longer-season sweet corn grown on its own without green peas. Sometimes lima beans or edamame (edible soy beans that are harvested green for human consumption) replace the first year of sweet corn. Each fall, after harvest, wheat or triticale is direct-seeded into the crop residue.

After three years in vegetable crops, the ground will be planted to potatoes. If the sweet corn is harvested early enough, a mustard cover crop is planted in August to help prepare the ground for potatoes and to reduce nematode pressure. Tilling before potatoes normally includes a deep shanking to a depth of about 14 inches that breaks up the soil and loosens any compacted areas. Compaction can be a significant concern, especially given that vegetable harvesting operations can require using heavy machinery when the ground is wet.

Livestock Integration

In addition to growing vegetables, Williamson both purchases young cattle to graze on the farm and custom grazes others' animals. Animals on the farm range from 400-pound calves to 800-pound yearlings to mature cows, depending on availability and prices. Because the Williamson family did not have extensive experience raising livestock, they have hired two employees to help manage the animals, with two additional part-time employees that assist as needed for moving cattle. They receive animals using a corral or 5-wire fence; once the animals are accustomed to being constrained by the electric fence they use single wire electric fencing.

The farm starts receiving animals in August when the first sweet corn is harvested. During the fall, winter, and spring, the cattle graze on corn stover, growing wheat, and triticale. The feed value of sweet corn stover is high when the crop is first harvested but declines rapidly with age. Thus, in the fall, Williamson's strategy is to move high numbers of animals quickly through the fields of crop residue to ensure the highest weight gain (Figure 4). Though stock density is adjusted depending on field quality, he often aims for about 1000–1200 pounds of live weight per acre over a period of 3–4 weeks. Normally the farm grazes between 2000 and 3000 head of cattle in the fall, with most of these animals leaving the farm in late fall.

In winter, a new group of about 1000 cattle graze, largely on triticale that was planted in August or early September. Stocking densities are usually lower in the winter, roughly 500–600 pounds of live weight per acre for 120–150 days. Animals are also fed baled lima bean hay made from lima bean residue plus silage made from wheat and pea vines. Feed is provided to the cattle until late March or April, when wheat growth accelerates and provides a new source of nutritional feedstock. Once that happens, an additional 1000 head of cattle are added, at a density of roughly 1800 pounds of live weight per acre for 40–60 days.

Figure 4. Cattle grazing corn stover in October 2015. Photo: Darrell Kilgore.

The Williamsons aim to purchase animals that will reach approximately 850 pounds by the time all the animals are sold in late May or early June. At this point, the farm enters its most active cropping season, as all fields have been planted to cash crops.

Integrating animals provides several benefits. First, livestock provide another marketable product that complements vegetable crops. Second, grazing helps them to control the amount of residue in their system, which can be an issue under irrigated conditions. As Williamson says, "There's still plenty of residue out there [after grazing] to prevent erosion but we have a much easier time strip-tilling." (See the *Residue Management Strategies* sidebar for more information on non-grazing strategies for managing residue.) Third, incorporating grazing animals benefits nutrient cycling and soil health.

"When we're grazing a growing cover crop like wheat in the spring, those wheat roots will bring up deeper nutrients and the cattle consume them and spread them back out again. We oftentimes see [soil test] potassium levels go up and phosphorus levels go down slightly after the grazing operation." Compared to harvesting the forage and removing it from the field, Williamson also feels that grazing cattle benefits soil health and organic matter through the manure they deposit on the field. "I think that's been a fairly important factor in increasing organic matter levels." Overall, managing the animal impact to fields has not been difficult. The main adjustment has been the need to level the field for planting after grazing.

Residue Management Strategies

Karen Hills, Center for Sustaining Agriculture and Natural Resources, Washington State University; and Andrew McGuire

Managing residue is critical in irrigated high residue farming. With irrigation, crops like wheat and corn produce high yields and large amounts of biomass. This makes it easier to maintain residue cover but having too much residue can be a challenge. With direct-seeding, residue in the planting row can hamper seedling emergence by physically blocking seedlings or preventing good seed to soil contact necessary for germination, and by lowering soil temperature. Cool soils are mostly an issue for corn and other temperature-sensitive crops.

While the Williamsons graze cattle on their fields to manage residue, livestock grazing is not a good fit for every farm operation. For these farms, a variety of other strategies can be used to manage residue levels.

Some strategies for managing residue occur at harvest. These include:

- Adjusting cutting height to leave as much residue standing and attached as possible (planters can more easily avoid standing stubble).
- Evenly spreading straw and chaff, if necessary by installing a high quality, after-market chaff spreader.
- Using a stripper-header for harvest of small grains, peas, and dry beans to leave more residue standing.
- Using combine header add-ons to crush, crimp, or cut up corn stalks.

Post-harvest operations for managing residue include:

- Harrowing to redistribute residue.
- Mowing with a rotary mower to reduce straw size.
- Vertical tillage can effectively reduce excess residue.
- Growing cover crops in the residue to increase residue decomposition rates.
- Removing residue by cutting and baling when there is a market for crop residues.

Other strategies occur at planting:

- Strip-tillage either removes or buries residue from the 6- to 12-inch wide tilled band.
- For direct-seed, no-till planting, residues can be cut with disk coulters or openers, moved from the planting row with row cleaners, or both. Residue will only need to be moved from the width necessary to increase soil temperature for desired emergence.

For more information, see *High Residue Farming Under Irrigation: Residue Management Through Planting* (McGuire 2014b).

Strip-Tillage Equipment

The farm has two strip-tillers: a 16-row Schlagel with 30-inch row spacing for corn, and a 12-row Unverferth with 22-inch row spacing for the beans. The operations are roughly the same for both machines. First, a coulter cuts through the residue, creating a slot. This is followed by a shank that tills the soil to a depth of about 12–14 inches, which helps undo damage from compaction. A pair of disks follows the shank and guides the tilled soil back into the strip rather than letting it spill onto the non-tilled soil. The next tool is a packer wheel that helps create a firm seedbed.

Behind the strip-tiller is a planter with trash wheels to remove any remaining residue from the strip. The planters' openers and closers will vary depending on field conditions and the crop being planted. Overall, Williamson feels that adjusting the trash wheels and the closing systems on the planters are the two most critical things to ensure that the whole system works optimally.

Beans are planted in the same pass as the strip-tillage operation, while sweet corn usually performs better if the planting is done in a second pass. In this case, precision guidance is used to align the tillage and planting passes.

Fertility and Soil Amendments

Williamson applies a small amount of nitrogen at planting (described below). The bulk of each crop's nitrogen needs during the season are delivered through the irrigation system. Phosphorus, potassium, and sulfur requirements are more complex, however. Experience has taught him that, given his farm's soils and water, he can only deliver a portion of the plants' required potassium through the irrigation system, and phosphorus cannot be effectively delivered using irrigation.

The bulk of phosphorus and potassium requirements are applied in the form of dry (25–30% moisture), stacked, aged (one year) manure that has been screened to remove rocks and other debris. With applications based on both manure testing and calculated nutrient needs over the following rotation, Williamson incorporates 10 to 15 tons of manure per acre during the tillage operations for potatoes, or surface applies the same amount on the crop preceding potatoes. He has found the aged manure does not supply much nitrogen, but low nitrogen at planting is typically preferred by potato growers, with most nitrogen applied in-season. Other plant nutrients supplied by the manure include calcium, magnesium, zinc, copper, boron, molybdenum, and iron.

Soil tests just after potato harvest are used to measure levels of phosphorus and potassium. Ideally, the levels of these nutrients will be on the high end of the desired range, so they will be adequately supplied during the remaining years of the crop rotation. If needed, Williamson will apply additional phosphorus and potassium to other crops in the rotation as a banded liquid starter fertilizer applied with the strip-tiller. This starter fertilizer also contains nitrogen for the emerging seedling.

Weed and Disease Control

Weed control is distinctly different under high residue farming compared to full tillage systems. Williamson applies at least one burn down herbicide (glyphosate) prior to planting to control small weeds that are emerging within the residue. If he is growing a crop with fewer labelled herbicides, or if there is high weed pressure, he will try to apply it twice. Both applications may occur prior to planting, or the second may be after planting but before crop emergence.

Although there is a potential for viable weed seeds to be incorporated with manure applications, Williamson says that the stacked, aged manure he purchases has not increased weed populations so far.

Williamson has not experienced significant disease issues with his high residue tillage system. In fact, eliminating the need to water to control wind erosion has reduced disease issues for young green pea plants. Also, although he prefers to kill cover crops a few weeks before planting to avoid the risk of Rhizoctonia root rot from the dying wheat infecting his main crop, in practice he has not actually had this happen. As a result, if the wheat plants are still too short to provide effective erosion control at planting time, he will sometimes plant the next crop directly into the growing wheat, killing the wheat with an herbicide application just before seedling emergence.

Benefits

Williamson has found high residue farming to be a game changer. It not only has eliminated the need to replant damaged crops, but also helps the crop stands emerge and develop more evenly. As Williamson says, “Uniformity is paramount because processing and marketing are both much more efficient when you have a uniform vegetable crop.”

High residue farming has also unexpectedly allowed the operation to expand without the need to add acreage—through double cropping during the cropping sequence and integrating livestock. “Double cropping works well because we can turn it around so fast. Under conventional tillage, it could take a week or so to get everything prepared and planted and now, we can be planted the next day.”

High residue farming, livestock integration, and amending soils with manures have also increased the naturally low soil organic matter levels of their sandy soils. Prior to adopting strip-tillage, soil test levels for soil organic matter were typically under 1%, whereas now it is common to have test levels from 1.5% to as high as 2% and, occasionally, even higher (Figure 5). Williamson feels that increased organic matter has further reduced erosion, improved infiltration, and increased the soil’s water holding capacity. (See the sidebar *Soil Health Improvement Reduces Erosion Risk and Improves Water Infiltration* for more information.) This in turn allows them to water more slowly and deeply, benefitting control of white mold caused by *Sclerotinia* spp., and other foliar diseases.

Though Williamson is most familiar with strip-tillage on his own farm, he does a fair bit of custom strip-tillage for others in the Columbia Basin, a strategy that has helped defray the costs of his relatively expensive strip-tillage equipment. (See the sidebar *Lessons Learned from Custom Strip-Tillage* for more information.) In the process, he has seen similar benefits from improved organic matter and water holding capacity on a variety of soil types.

High residue farming has also reduced some other costs. Williamson says, “I think at the time that we switched over, we had nine or ten tractors and now we have three. Of course, they're bigger, more expensive tractors, but for every one of those tractors, you have to have an operator and you're doing repairs and you have fuel costs, too.” He also thinks that reduced nitrogen leaching has meant that they spend slightly less on fertilizer nitrogen.

Figure 5. Increased residue levels, along with soil amendments and grazing, have increased soil organic matter and improved soil structure on the farm. Photo: Darrell Kilgore.

Crop yields have been roughly similar before and after adopting strip-tillage. “We were prepared to take a yield reduction, even 10%, when we switched to strip-tillage, with less tractor work and the benefits of not blowing soil away and not leaching fertilizers. But we haven’t seen that. There are still people doing conventional tillage around and, you know, the yields are really similar. And when the wind blows harder, our yields are usually better because we're not sawing the plants off.”

Challenges

When the Williamsons first adopted high residue farming, a major challenge was that there were few other irrigated farms who were using this strategy. This meant that they had to adapt techniques that were more suited to Midwestern farms and do a fair bit of experimentation on his own to adjust for the conditions of the Columbia Basin.

At times, Williamson still struggles to create a good seedbed when planting into wheat residue. While he occasionally has to deal with this by strip-tilling the field twice, he normally finds that if he takes time to adjust the tiller, he can get the results he wants in one pass. Another technique he sometimes uses is to block off every fifth row on the grain drill when planting wheat. Given the drill's 6-inch spacing, this leaves an unplanted strip every 30 inches, so that he can strip-till corn and move the tiller more easily through the unplanted row (Figure 6).

One last challenge Williamson faces is getting the wheat crops planted early enough in the fall so they are tall enough to protect the ground from high winds over the winter. This is a common problem for producers who use an over-winter crop in this way.

Figure 6. Wheat planted in strips in October 2015. Photo: Darrell Kilgore.

Soil Health Improvement Reduces Erosion Risk and Improves Water Infiltration

Karen Hills, Center for Sustaining Agriculture and Natural Resources, Washington State University

Residue protects soil from erosion not only by providing physical protection but also by increasing the concentration of soil organic matter at the surface of the soil. As the residue breaks down through biological processes, this helps to form soil aggregates—a composite of soil particles that clump or bind together, giving soil its structure. The spaces between aggregates allow for aeration, water infiltration, and root penetration. A well-aggregated soil resists crusting, allowing water to infiltrate rather than run off and, thus, reduces the risk of water erosion (Figure 7). The formation of aggregates also makes soil less prone to wind erosion since individual soil particles are held within the soil aggregate (Figure 8).

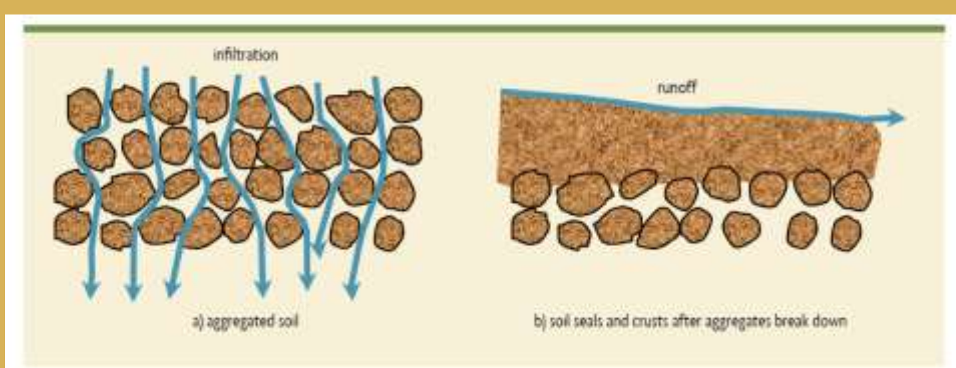

Figure 7. An aggregated soil surface (a) allows water to infiltrate, while a soil without aggregations on the surface can seal and crust, leading to water runoff (b). Figure: Magdoff and Van Es 2009.

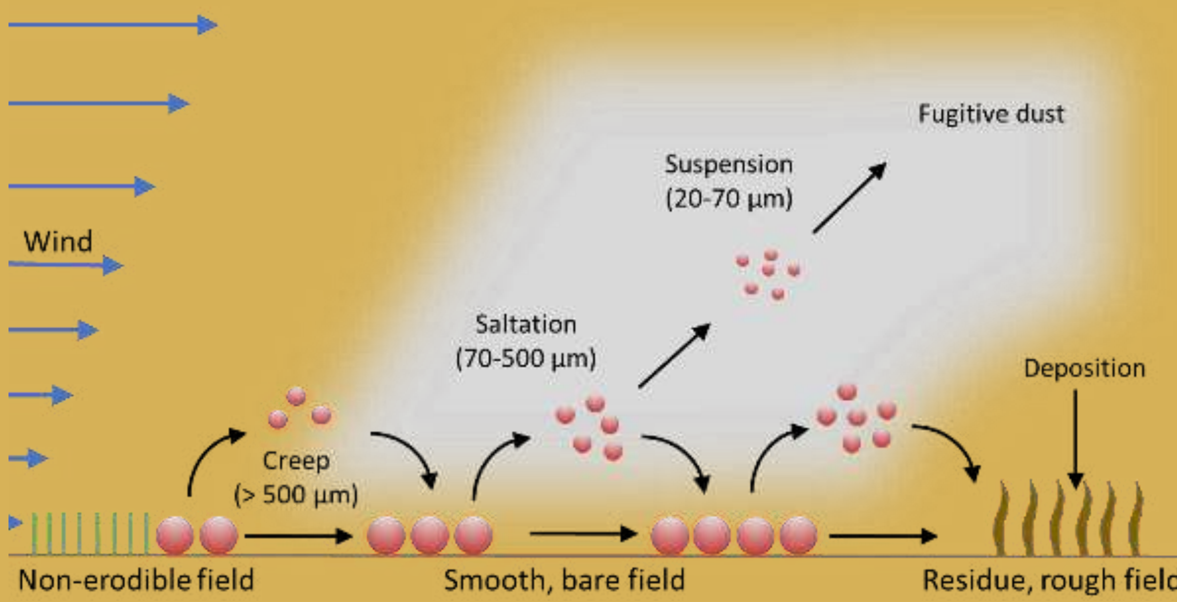

Figure 8. Wind erosion from agricultural fields involves the movement of soil particles through the processes of creep, saltation (short bounces along the soil surface), and suspension. The bouncing of larger particles on the soil surface can give rise to the suspension of small particulates in the atmosphere, which can be transported great distances. Deposition occurs when wind speed near the ground surface is slowed by obstructions, such as crop residue. An aggregated soil surface is less likely to result in wind erosion, as soil particles held within aggregates are less prone to movement. Figure modified from Papendick et al. 1997.

Managing Risk

Williamson has found that high residue farming, in combination with livestock integration, has reduced his production risk, mainly by reducing soil erosion and enhancing soil organic matter. Williamson says, “The rule I always used to use for myself was if we were going to have a 15-mile-an-hour wind or more, we started to water. Now, I don't really even think about it till we're anticipating 25, 30 miles per hour. And usually, with all the residue out there, if we can get one lap of the pivot before a 30-mile-an-hour wind, we usually don't have any problems.” Given that the top few inches of soil are critical for maintaining productivity, protecting this topsoil benefits the long-term viability of the farm.

Williamson also feels high residue farming has reduced economic risk. First, with reduced costs, the breakeven point for each crop is lower, which helps maintain profitability under a wider range of market prices. Second, economic risk is reduced because they rarely have to replant seedlings that were destroyed during windstorms. “If you have to replant a crop, you have to buy another round of seed as well as the labor for the planting. And usually you have worse weed problems, and the crop is not as good.” (See *High Residue Farming Resources* sidebar for more information on strip-tillage and other high residue farming practices.)

High Residue Farming Resources

A five-part series of publications from Washington State University Extension, titled *High Residue Farming Under Irrigation*, covers this topic in more depth, including the following subtopics:

What and Why provides an overview of high residue farming, including its benefits and challenges. It also discusses some special considerations for high residue farming in the irrigated agricultural regions of the far western United States.

Crop Rotation covers choosing a cropping sequence, specific cover crops, and special considerations for irrigated cropping systems in the far western United States.

Residue Management through Planting explains how to plant crops into high residue conditions with a planter or drill. It covers residue management, planter and drill modification, and soil fertility adjustments.

Pest Management Considerations gives an overview of the effects of adopting high residue farming on the management of weeds, insects, and diseases.

Strip-till covers the benefits, challenges, and implementation of strip-till planting. This particular high residue farming system combines some of the benefits of clean tillage systems with those of high residue cover.

The High Residue Farming Network is a site designed for the sharing of projects, events, and resources related to high residue farming in the irrigated West among producers as well as Extension, NRCS, and other agricultural professionals. Links are provided to many publications, videos, and websites relevant to this topic.

Looking Forward

While Williamson anticipates ongoing economic challenges for farmers, he feels his strip-tillage and direct-seeding strategies position the farm well to withstand these. Except for potatoes and transplanted crops, which require full tillage, Williamson thinks most crops could be grown successfully using strip-tillage or direct-seeding techniques.

With the drought of 2015 at the forefront of his mind, Williamson notes climate change is likely to be an ongoing factor. In his mind, the impacts climate could have on water supplies are a bigger potential concern than impacts from changes in temperatures. While his water, which comes from groundwater and surface water from the Columbia River, is likely to remain reliable, he worries that other farmers with less reliable surface water supplies may have fewer options and be greatly affected. “This year, we only got about five inches of precipitation from the sky, and the rest we had to put on ourselves.”

In contrast, warmer temperatures could represent an opportunity to lengthen the growing season and grow new crops, as long as there are not frequent extremes. He does think that if hot spells become more frequent, having residue cover would likely benefit the crops by improving water use efficiency and reducing evaporation from the soil.

Advice for Others

Williamson was asked what advice he would give to others who are seeking to reduce tillage in irrigated systems.

Focus on planting. “I've seen people focus on the strip-tillage part to the detriment of the planter part of it—but setting up the planter just right is very important, and it's a little bit of a different setup than in a full-tillage situation.”

Think through how best to integrate any new equipment and new practice with your operation as a whole. “I think the equipment's out there, the technology, the expertise is out there to get it done, but you have to fit it to the tractors you have, and really think through how you're going to do weed control and fertilization in order to use this system to get a seed in the ground.”

Lessons Learned from Custom Strip-Tillage

Through his custom work, Williamson has gained experience with strip-tillage on soil types other than his fine sands, and notes that strip-tillage provides benefits in heavier soils as well. When irrigating heavier textured soils, such as sandy loams and loams, water sometimes runs off, as water application rates exceed water infiltration rates. Traditionally, these soils were fully tilled and then dammer-diked, creating pockets in the soil that trap the water and prevent it from running down the slope. In many fields, Williamson has found that high levels of residue help hold water in place, allowing it time to infiltrate into soils. However, in some fields, heavier soil textures with more silt and clay combined with low organic matter can have significant water erosion due to slow infiltration. Sprayer tracks can also cause runoff in heavier soils.

Whatever the soil type, Williamson says that it is important that plant residue be anchored to the ground for the strip-tiller to work effectively. “When we custom strip-till, a lot of people would like to disk the field before we show up. If you've gone through and done some tillage, it's a lot harder to move the root balls and stuff around and you get more plugging and that sort of thing. So, it's usually counterproductive to do tillage ahead of the strip-tillage.”

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