

Cover crops case studies

JenEhr Family Farm

Vegetables, fruit and pastured poultry

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Wisconsin is seeing a renewed interest in planting cover crops to prevent soil erosion, retain or add nutrients, reduce pest pressures and accomplish other goals. Farmers and educators are asking questions about which cover crops to plant, how to fit them into different cropping systems and what equipment is needed to plant and manage them.

This case study presents the experience of a Wisconsin vegetable grower who has been growing cover crops for more than ten years. He describes his philosophy of cover crop use and offers his perspectives on what cover crop strategies have and have not worked on his farm, what benefits he receives from growing cover crops and how he manages these crops. Farmers and researchers can use this information as a starting point to explore how they might develop cover crop systems to fit their situations and meet their own goals.

Summary of the operation

Paul Ehrhardt and Kay Jensen have been growing vegetables, fruit and poultry on their Sun Prairie farm since 1997. According to Paul, crop and livestock diversity is one factor that sets JenEhr farm apart: “We are very diversified in what we do, and that is on purpose ... we feel you need an animal component to make a vegetable farm more sustainable.”

Paul and Kay raise around 20 acres of fresh market vegetables and five acres of strawberries and blueberries on their farm (www.wisconsingrown.com). Livestock production takes up another 25 acres, with about 6,000 chickens and 250 turkeys on pasture. The rest of their land is in wetlands, woodlands and streams. While the whole farm is certified organic, the poultry receive some conventional feed and therefore are not organic.

Kay and Paul take a distinctive approach to land management: “We have 110 acres and we are only

farming on about 50 acres ... we look at what’s the best use of all the different parts of our farm. There are a lot of pieces of our farm that are best utilized for wildlife habitat; they’re not best utilized for cropping.”

About 40 percent of Paul and Kay’s sales are to their Community Supported Agriculture (CSA) shareholders, around 33 percent to wholesale markets and about 27 percent through farmers’ markets. Paul is in charge of production. Kay handles the marketing and other aspects of managing their business. According to Paul, this division of labor keeps things running smoothly: “The partnership between my wife Kay and me, it works really, really well ... It allows me to focus on the production side of things.”

Paul and Kay employ one full-time, year-round person; six full-time, seasonal workers; and three to four seasonal employees who work twenty hours per week. They also hire people to provide retail services at farmers’ markets. Several times during the growing season they hire crews to weed and harvest strawberries and beans.

Cover crops grown on the farm

Paul uses pasture as a kind of extended cover crop in rotation with vegetables. He uses this approach on erosion-prone, sloping land. About half of the farm’s cropland (26 acres) is slightly hilly (5 to 10 percent slope); the rest is flat bottomland.

Paul divides the sloping land into two 13-acre management units and rotates them into pasture seeded to a mixture of clovers and winter wheat for two years, followed by two years of vegetables. He raises chickens and turkeys on the pasture. After two years in clover, the pasture is tilled and the land is put into vegetables that need a lot of nitrogen, such as broccoli and cauliflower.

The second year, Paul plants crops with lower nitrogen needs, like beans and radishes. After two years of vegetables, the field is planted back to clover.

On his bottomland, Paul rotates annual grass cover crops—winter wheat, rye, oats and barley—with his vegetables. These small grains add carbon and biomass to the soil and slow erosion. He has experimented with Sudangrass and soybeans, with mixed success. He is interested in trying field peas, likely planting them with barley and triticale. With a spirit of experimentation, Paul says, “I am going to continue to try other crops in there as well.”

The goals and benefits of cover crops

Paul uses cover crops to manage soil erosion, build and improve the soil and promote soil biodiversity. These improvements contribute to JenEhr farm’s overall health and sustainability.

Paul has observed abundant earthworms and dramatically improved soil structure when he brings clover fields back into vegetable production. He has studied research showing that manure enhances the biodiversity of the soil by encouraging bacteria, fungi, earthworms and other organisms that help break down organic matter. “I look at earthworms as an indicator species. And if I’ve got a good, healthy population of earthworms, that means my microbial and other small insect populations ... are also going to be doing very well.”

Paul notes that when cover crops are incorporated, weed pressure may be reduced as a result of “doing tillage at different times of the season, exposing different weed seed banks.” Paul occasionally uses weeds as a cover crop “if it is the right situation ... and as long as I can catch them before they go to seed. For example, one year I was supposed to plant something in a field and it all just came up to foxtail. I ended up working it in and having a great potato crop off of it.”



Paul has seen significant improvements in his soil since he began managing his farm. “Since I’ve converted my farm to or-

ganic production, the soil is completely different than it was fifteen years ago, when it was just conventional corn and soybeans.” His soil now has better structure and water infiltration, and there is significantly less standing water in the fields.

“ I really believe in taking a break from tillage ... letting the soil regenerate, rebuild a little bit. ”

He admits that organic vegetable production, which requires a substantial amount of tillage, can contribute to significant soil loss. “This is why I make sure I have some soil-building years on the back side of the cropping years.” On any area of the farm with greater than five percent slope, Paul takes great care to keep the soil vegetated, and he never cultivates it for more than two consecutive years. “I really believe in taking a break from tillage ... letting the soil regenerate, rebuild a little bit.”

Cover cropping with poultry on pasture

Paul first began thinking about cover crops when he and Kay decided to start raising chickens on clover-based pasture. Originally, they ran poultry on a pasture for three to four years before rotating the pasture back into vegetables. However, in the last few years they have increased their vegetable acreage. Now they typically run poultry on a pasture for just two years before rotating it back to vegetables.

Paul usually frost-seeds a mixture of red clover, Ladino clover and winter wheat in late March or early April with a broadcast seeder, and sometimes packs it with a roller. He used to plant oats or barley as a nurse crop, but he finds that winter wheat planted in spring is less aggressive and requires less management.

He aims to have six to twelve inches of growth on his clover pasture before the poultry pens go on it. If the clover grows higher than twelve inches, the chickens have trouble grazing it, so he will flail-chop the pasture a week or two before the chickens and turkeys come through, cutting the forage to about six inches. He also flail-chops the area after the poultry graze it, to kill thistles and other weeds before they go to seed. On average, the pasture is mowed three to four times per year. Paul usually avoids cutting it in the fall unless he is trying to kill the clover in anticipation of the next year’s vegetables.

Annual cover crops

Paul began adding annual cover crops to his vegetable rotations when he realized “there were a lot of fields I wasn’t able to get chicken pasture on, so it got me looking more at other annual cover crops and partial season cover crops.” He carefully coordinates the planting of his vegetable crops with his cover crops so that bare soil is minimized.

When planting a cover crop, Paul considers when the field will next be planted to vegetables. If he needs to plant early in the spring, he will make sure that the preceding cover crop is winter-killed. If he plants a cover crop late in the season, he won’t put vegetables into that field before early summer. “The later I get a cover crop planted in the fall, the later I am going to let it grow the next spring.” This gives the cover crop time to produce ample biomass to return to the soil.

Typically, if Paul has a vegetable crop coming out of a field between June and the third week in July—and he doesn’t need to plant anything else in that field for the rest of season—he will plant a cover crop that winter kills, such as oats or barley. If a crop is harvested between the middle of July and the middle of August, he will plant winter wheat. After mid-August, he switches to winter rye. Under ideal conditions, he plants winter rye before the middle of September. However, he will plant rye later in the season to ensure that his field is covered in the spring.

When Paul harvests a vegetable crop too late in the season for planting rye, he might till the field in the fall and plant oats in the early spring. The oats can then be worked into the soil in time for planting a late vegetable crop.

As for spring planting of small grains or clover, Paul says the earlier, the better. His best stands have been planted in late March. While early planting is done at the mercy of the weather, he tries to have all spring-planted cover crops “in the ground for sure by mid-April.”

The challenges of cover cropping

The biggest cover crop challenge Paul faces is the weather. Dry conditions can lead to poor germination, resulting in more weeds than cover crops. At the other extreme, sometimes it is difficult to get cover crops planted—or killed—because of excessive rain.

Timing the planting, growth and tilling of a cover crop between vegetable crops can also be a challenge. There is a tension between letting the cover crop grow in the spring to accumulate enough biomass to benefit the soil and killing the crop early enough to get the field ready



A rotovator is a useful tool in cover crop management

for planting. For example, when Paul plants a field to a fall rye cover crop, he wants to maximize its growth and potential soil benefits, but he has seen lower yields of the subsequent crop when he plants less than four weeks after tilling in the rye.

Because JenEhr Farm is so diverse, it can be difficult for Paul to find enough time to work with his cover crops. But he feels he has to make this a priority. “You can’t passively do cover cropping . . . it’s got to be something that’s as important as your crops and it has to be planned ahead of time.”

Tools and techniques

Paul plants small grains with an old seed drill. He incorporates all of his cover crops with a Kuhn EL 102 rotovator. He runs the rotor somewhere between 250 and 325 rpm. His techniques for using this tool vary slightly, depending on the cover crop and the goal.

When Paul converts his pastures to vegetable fields, he runs the rotovator three to four inches deep with the shield all the way up so

that residue lands on the soil surface. He always kills 100 percent of the clover using this method.

“You can’t passively do cover cropping.”

To incorporate his small grains in midseason, Paul tills them before the flag leaf—the uppermost leaf—has emerged. At this time, he works in the cover crop three to four inches deep with the shield all the way down to incorporate the residue into the soil.

Because Paul tills near the surface, a lot of residue is left in the top layer of soil. This technique reduces soil disturbance, but it may slow the decomposition of the cover crop residue. For this reason, Paul often tries to incorporate the cover crop a couple of times before planting.

Paul waits at least four weeks between first working in a cover crop and planting vegetables. After the initial pass with the rotovator, he waits two weeks. He may till a second time if it seems necessary. He then waits for rain and weed emergence. If he has time, he may come through with a field cultivator to kill weeds. Either way, he tills one final time before planting. In general, Paul thinks the longer he waits to plant vegetables, the more the cover crop residue will break down and feed the soil.

He usually does not chop any of the cover crops, instead preferring to turn the whole plant into the soil with the rotovator. That way, he is sure that the plant is incorporated into the soil while it is fresh, with one pass and one implement. If he were to run out of time and leave the chopped plant lying on the surface, much of its nitrogen would be released into the air instead of into the soil.

The economics of cover cropping

Paul estimates that cover crops account for about five percent of his field work. He considers this an insignificant investment relative to the improved soil quality and other benefits he has seen from cover cropping.

While Paul keeps careful records of the fields he has in production, he does not specifically calculate the economic impacts of cover crops on his farm. Instead, he simply thinks of them as a necessity. “I always feel it is kind of immaterial what it is costing you, or the money that you could get if you put that field into a crop rather than cover crop, because cover cropping is something that you have to do in order to have a sustainable system.”

Much of Paul’s cover cropping philosophy comes from the lessons of managed grazing. Referring to comments from Allan Nation, editor of the *Stockman Grass Farmer*, Paul says, “When you look at the big picture ... [purchased seed] is a really small input, even if it is costing a couple hundred bucks an acre to put an expensive clover seed on ... So, I never really look at the economics that way. I am not looking for the cheapest seed I can put on. I am looking to get the type of crop on that’s going to do for me what I want it to do; what I need it to do.”

Learning and planning for the future

Paul receives most of his information about cover crops from other farmers and field days. He has reviewed research on the nutrients various cover crops contribute to the soil. But he is more interested in what cover crops, alone or in combination, are doing for his soil microbes. What microbial populations are encouraged or discouraged by particular cover crops? How do different cover crops affect pathogens in the soil? How do cover crops impact weed seed banks and weed populations?

Paul figures he will need another ten years to completely figure out his cover cropping system. Despite the fact that he downplays the sophistication of his system, one thing is clear: Paul has taken deliberate steps to make cover cropping a part of his farm. “For many years I had a schedule that told me when to plant broccoli. I needed a similar schedule for cover crops so that I would take them just as seriously as I would planting broccoli or strawberries. Having this kind of schedule is what really helped me to get a better system going on my farm.”

Further information on cover crops:

Midwest Cover Crops Council, www.mccc.msu.edu

Cover Crops on the Intensive Market Farm, John Hendrickson, UW-Madison Center for Integrated Agricultural Systems, www.cias.wisc.edu/wp-content/uploads/2008/07/cvrcrop.pdf

Managing Cover Crops Profitably, Sustainable Agriculture Research and Education Program, www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version

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