ORGANIC COVER CROP CASE STUDIES

Lily Lake Organic Farm

Dave Campbell

Farm location	Maple Park, IL
Certified organic acres	155 certified, 153 tillable, 2 in NRCS EQIP
Total acres	224
Year of initial organic certification	1990; originally with Organic Growers and Buyers Assoc., now with MOSA
Primary cash crops	Corn, soybeans, winter wheat, oats
Years planting cover crops	Since 1988
Frequently used cover crops	Medium red clover, field peas, oats, buckwheat, oilseed radish, winter rye, sorghum sudangrass
Livestock on farm	None
Soil type	Clay loam, silt loam

Brief Farm History

Lily Lake Organic Farm has been certified organic since 1990 and is operated by Dave Campbell and his family. They began incorporating cover crops as a part of organic transition in 1988 when they took over the farm. Prior to that, the land was farmed conventionally from 1963-1987 in an exclusive corn and soybean rotation. There were livestock on the farm prior to 1963. Cover crops weren't used during that time, but alfalfa, grass and clovers were used in hay and pasture rotations. Since 1988, Campbell has been planting red clover with oats or frost seeding red clover into winter wheat. He was also an early adopter of planting cereal rye after corn before soybeans.

Cover Crop Use & Goals

The benefits Campbell sees on his farm from using cover crops include weed control, erosion reduction, soil building, nitrogen fixation, nitrogen scavenging,

and an increase in beneficial insects.

Benefits are specific to each cover crop species. For example, Campbell uses oilseed radish to loosen the subsoil. He uses three primary covers for weed control: sorghum sudangrass, cereal rye and buckwheat. Specifically, Campbell uses sorghum sudangrass as a smother crop for Canadian thistle suppression.

Buckwheat with monarch butterfly

He considers cereal rye excellent for weed control due to its allelopathic compounds. However, managing rye growth in the spring can be challenging. If it is too wet and Campbell can't get in the field to terminate the rye, it can grow very quickly, risking termination, and become more of a problem than a benefit. Buckwheat provides several benefits to Campbell's cropping system. It is allelopathic, contributing to weed control, is a soil builder, and scavenges for phosphorus.

Campbell would eventually like to grow buckwheat as a marketable grain crop, with sales, to this point, being solely to an organic seed house. Campbell grows clover and peas before corn to provide a nitrogen credit. When Campbell applies manure in the spring to a cover crop prior to its incorporation, the cover crop also assists with slower nitrogen release by taking up and holding some of the nitrogen in the plant biomass. This nitrogen is then released following cover crop termination and can be cycled to the following cash crop.

Crop Management

TYPICAL ROTATION

Campbell starts his standard rotation with oats or wheat, underseeded into red clover. Corn is next, with a fall seeding of rye after the corn. Cereal rye residue is incorporated before soybeans the following year. The farm has used less rye since 2013, as spring field conditions have tended to be more wet, creating a challenge for rye termination. When Campbell began cover cropping, cereal rye was instrumental in alleviating heavy weed pressure. **After many years of cover cropping, combined with a strong focus on weed management, their fields now experience less weed pressure. This has reduced the farm's dependence on rye for weed control.**

FIELD OPERATIONS

Campbell includes several types of field cultivation in the operation. He uses two different types of field cultivators; one has nine-inch wide sweeps while the other has two-inch wide points and is considered a quack digger-type of field cultivator. Campbell prefers the quack digger to the cultivator with sweeps, as it creates less soil disturbance.

In the fall after corn harvest, stalks are chopped and then Campbell uses a tandem disk for residue sizing, as well as a field leveling tool to achieve more consistent depth placement during planting. **He seldom uses his moldboard plow anymore in the spring, although on rare occasions he may moldboard plow down a cover crop of red clover in early to mid-May followed shortly by a pass with a tandem disk.** Approximately two weeks after plowing and disking, he will plant corn. This leaves the ground bare for only around three weeks before corn emerges. For weed control in the row, Campbell uses a rotary hoe followed by a cultivator. Cambell owns all his own equipment.

Cover crop termination strategies vary by species. Many of the cover crops Campbell plants will winterkill, such as buckwheat, field peas, and radish. Cereal rye and red clover are exceptions. Campbell likes to sow field peas as an early spring cover crop before corn is planted, in part because they are frail and break down very easily with two passes with the tandem disk. Unlike red clover, corn can be planted immediately after incorporating field peas which allows for an additional two weeks of cover crop growth when using field peas versus red clover. Additionally, he doesn't need to use the moldboard plow to incorporate field peas versus a cover crop of red clover.

Red clover after oats harvest, with corn

Regarding red clover, Campbell will clip it very shortly after oats or wheat harvest to encourage regrowth and then again in early September to greatly minimize weed seed dispersion and to encourage additional regrowth.

Later in the fall, he typically chisel plows the stand of red clover. The clover will begin to grow back slowly in the spring, which allows for some ground cover, but not enough to prohibit coming in with a quack digger to prepare the seedbed before corn is planted. He also typically uses two or three passes in the

spring with the field cultivator before corn planting.

NUTRIENT INPUTS AND TIMING

Lily Lake's main plant nutrient source is chicken manure applied the summer before corn planting to a red clover cover crop, or immediately before planting a cover crop mix of field peas, oats, and oilseed radish in early August. Campbell has also applied chicken manure early in the spring immediately before a cover crop of field peas. He also applies a custom organic starter fertilizer blend containing trace minerals adjacent to the row at corn planting. Other fertilizers and soil amendments, such as gypsum, organi-cal, high calcium lime, soft rock phosphate, potassium sulfate, and humates are also applied. On soils with a pH in the 6.0 - 6.4 range, he uses high calcium lime. On soils with a pH of 6.5 or greater, he will apply gypsum or organi-cal to increase base saturation levels of calcium and decrease magnesium levels.

SEEDING AND ESTABLISHMENT

Campbell believes late summer, approximately mid-July to mid-September, is a great time to plant a cover crop in fields rotating out of a small grain crop, such as oats or wheat. However, he cautions the ground can become very dry or on occasion, an intense rainfall event can cause erosion, making the field too dry or too wet for effective field operations.

When planting large seeded cover crops such as rye or oats, Campbell likes to use a 3-point tractor-mounted seeder to save time in the field, as compared to a slower grain drill. When planting cover crop seeds that are smaller in size, more expensive, or harder to establish, Campbell will seed with his grain drill to ensure seed to soil contact and establishment, making the most of his seed costs. Examples of species Campbell plantes with the grain drill include covers such as buckwheat and oilseed radish.

When it comes to frost seeding red clover, Campbell has tried three different methods: aerial seeding with a plane, using a grain drill, and using a 3-point tractor mounted seeder. He prefers aerial seeding given the very minimal cost and the elimination of soil compaction and disturbance on his established winter wheat.

When frost seeding red clover aerially, Campbell is diligent to seed on frozen ground in very late February or very early in March to ensure the seeds will be exposed to numerous cycles of daytime thawing, coupled with nighttime freezing. However, on fields not aerial seeded, Campbell typically seeds in late March or early April when the temperatures are warmer.

He has found red clover germinates very well when seeded on top of the ground, even after the "true" frost

seeding window, assuming a decent rain event occurs within a few weeks after seeding the clover.

Advice to New Cover Croppers

Campbell has been working on his cover crop rotation for many years. He gathers information from Sustainable Agriculture Research and Education (SARE) publications, the Midwest Cover Crops Council (MCCC), The Canadian Organic Growers Field Crop Handbook, Albert Lea Seed House, and Welter Seed. He highly recommends SARE and MCCC publications for beginning cover croppers.

Campbell knows a farmer must find the windows of opportunity in his/her cash crop rotation for adding a cover. **He comments, "There are probably more opportunities than you think" when one considers tweaks or adaptations that can be made in the rotation to include covers.** An additional suggestion for starting in cover crops is to use the organic transition period to grow multiple cover crops blended together or planted alone, especially if income is not needed during this time of organic transition. Different species of cover crops will address different issues in the soil and will help to optimize growing conditions for a certifiable organic crop.

Campbell also recommends applying manure well before planting a corn crop, so the cover crop can tie up nutrients from the highly soluble manure well in advance of corn planting, particularly in order to reduce the leaching of nitrogen. This can be accomplished by applying manure during the late summer on top of a cover crop of established red clover, applying manure before planting a late summer cover crop, or even applying manure in the spring immediately before sowing field peas as a short season cover crop. Campbell's key reasoning behind this strategy is because manure-derived nutrients are highly soluble, applying manure close to corn planting with no cover crop to utilize the extra nitrogen will result in nitrogen loss, as well as the promotion of weed growth early in the season, resulting in heavy competition with the establishing corn crop.

Field peas at Lily Lake Organic Farm

Looking to the Future

One rotation Campbell is working to perfect is using spring-planted cover crops prior to corn. He plans to sow a mix of oats for a cash crop along with red clover as a cover crop very early in the spring, harvest the oats for grain, followed by the incorporation of the red clover in early to mid-August. He will follow the red clover with a blend of field peas, oilseed radish and oats, which should winterkill, and the field will be planted to corn in the spring. **Campbell is hoping the sequential planting of nitrogen fixing cover crops (red clover followed by field peas) will not only improve soil health, but will also increase corn yields with the potential increased fixation of nitrogen by two separate cover crops.**

Overall, Campbell has added new species and tried new cropping practices, but is concentrating on incorporating and balancing cover crop use with his entire farm management system for the desired goal of increased yields via fertility building, along with excellent weed control. In other words, he loves to fine tune his management with new cropping strategies to meet his production and soil health goals.

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