



Wyatt Barnes on Cover Crops for Colorado's Front Range

Wyatt Barnes and his wife Amy own Red Wagon Farm, an organic vegetable farm located on the SE corner of 63rd and Oxford roads near Niwot. He sells to restaurants and a CSA. Several years ago, he became increasingly concerned about rising phosphorus levels in his soil from applications of compost. He switched to using cover crops, and found many benefits, including a 25% increase in yield, many fewer weeds, healthier soil, less salt build up in his soil, and decreased picking costs due to larger sizes of his produce. Wyatt's essay about cover crops follows.

A huge part of our job is fertility management. Is your soil getting better, worse? Or staying the same? If it is not getting better, it is probably getting worse! Ours was getting worse and after trying many things such as adding compost, crop rotation etc. we started cover cropping.

On many farms, soil fertility and tilth are getting worse. It is always challenging and expensive to keep soil fertility high. On some smaller scale farms, compost and occasional cover cropping might be adequate and practical. At a certain scale, the cost of material and difficulty spreading it where and when you need it becomes challenging. For us, we had poor soil that was heavy clay and was getting cloddier and worse most of the time.

Crops don't put down enough roots to improve soil tilth. Some like arugula put down great roots but something like winter squash on wider spacing means there is no living root in most of the soil at the surface. Keeping organic matter high is always difficult. Getting equipment, and planting relatively inexpensive seeds to fix N and improve tilth is much cheaper than buying compost and fertilizer.

An awful lot of what I want to say relates back to profitability. You need to farm profitably or nothing else will matter. With the cost of labor being so high and much of the labor being inefficient workers, it is critical to increase yields. How? Most vegetable farms around here don't water enough and never have enough nitrogen. This is pretty basic but is an ongoing recurring issue. We have seen 25% yield increases with good cover cropping and using some fertilizer such as Sustain or Nature safe 13-0-0. We use less than 2000 pounds of fertilizer on 20 acres so we are not adding that much. We rely heavily on cover crops for fertility. Cover crops breaking down provide plant available nutrients that can be taken in more easily than extracting minerals from the soil. Plants grow bigger, more quickly and have less disease and pest pressure.

Cover crops are one of the best ways to increase N affordably. Keep in mind that when you add manure-based compost you get very little N and lots of P and K. Phosphorus can quickly become too high, which often causes some weeds to really do well. A bag of seed is not expensive and does not add salts to the farm.

It is hard for me to just talk about cover crop without talking about how it relates to overall farm profitability, reductions in labor, efficiency gains in planting less and having high yields. Yes it is expensive and a big change but that change makes everything else different. Picking 6-pound cauliflower for CSA shares is a lot better than picking heads under a pound and having to give members 2 each. Having higher numbers of marketable peppers or winter squash per

plant is so much more profitable than just planting more. Cover cropping can create this change but requires a change in thought and a change from what you have been doing.

Changing to use cover crops to improve soil tilth and fertility was a difficult change in planning and equipment needs. The planning to add cover crop was so hard. Now I pretty much try and plant a crop, then a cover crop, then a crop again. This simplifies the planning. I leave large blocks in cover crop that I can plant into easily if I screw up. I usually plant some blocks of pure peas that can be incorporated in 2 quick passes with our tiller. I usually leave some ground in a cover crop that will winter kill.

Getting the equipment to have a system and then figuring out planting dates and getting seed was tough. The first few years it felt like we were paying for next year's fertility this year and that cost was hard to take financially.

What I am talking about is specific to vegetable farms and the amount of money per acre that we are grossing. Veg farms should gross well over \$20K per acre with many achieving significantly more, over \$50K. Bringing in this much money per acre allows us to invest in the cover crop since it will return so much and give us higher yields, which makes this work financially. On commodity crop fields like corn, where the gross income is less than \$1000 per acre, this type of investment will be trickier to make work.

The main things needed to cover crop are **equipment**, **irrigation** and **time**.

Equipment: We were undercapitalized and had a long list of equipment and vehicles and refrigerators that we needed. Getting the equipment to cover crop was challenging and scary since I did not know if it was going to be a waste of time and energy. It does work, but you want to try and grow great cover crops for it to work.

We had tractors and a considerable number of implements but to manage cover crop you need a tractor, plow, cultipacker, flail mower, roto tiller and seeder (preferably no-till seeder). There's a good chance you will need more than one tractor so one can be planting and doing normal farm work and the other can be doing cover crop related work. You will probably need more equipment than you have so you can do the normal work and cover crop related work at the same time when there is a weather window etc.

We have fairly large equipment for our scale of farm and can get things done very quickly. This is critical to our farming success. Running an 80 hp tractor and planting an acre of cover crop in under an hour makes it so we can get it done. If we were running smaller equipment, the speed of the tractor and width of the planter is narrower, which means the process is so much slower and takes too many hours, and you can't get it done. We can drive at about 5 mph when planting.

The efficiency of larger equipment rather than paying labor is a concept that many farmers struggle with. Trying to calculate the equipment cost and compare it to the cost of labor is complicated. Sometimes you can see that something will pay off in one year. Sometimes it is easy to figure that in 3 years it will pay off. If we had not been constantly investing in efficient equipment we would not be farming. It's too hard to get workers and the hourly cost has gone

up. Good equipment often results in reduced exhaustion in your crew. Not destroying your crew all season gets important in the fall when everyone is dragging and there is so much to do.

I agonized for a few years over a no-till or regular grain drill. I'm very happy I went with a no-till drill. It seemed like a big risk at the time to invest so much into it. We can plant cover crop directly into veg fields without having to work the soil. It saves time, wear and tear on equipment and disturbs the soil less. The time to till or plow, cultipack, etc. are significant, so not having to do all that prep when you use a no-till drill is important. I frequently plant a cover crop into standing cover crop or just mow off the first one. The time savings more than justifies the no-till drill.

Irrigation: You need pumps and irrigation lines. A reel gun – a sprinkler on a traveling hose reel- can be helpful tool. However, they require a lot of time to manage and move it around. They also require a lot of pressure to run: 100 psi. That can blow up pipes and fittings. The most practical water system for us is to hand move aluminum pipe. We use decent size pumps. It is not that expensive to have an oversized pump so you can move water when you really need to. It is easy to run the pumps below full output. You can throttle down a gas pump, or with an electric pump you can bleed excess back into where you are pumping from. Our VFD (variable frequency drive pump) is a life saver of a tool but expensive.

Time: It is really difficult to put off harvest and other immediate farm problems and make sure you get cover crop planted and watered. This means time to clean up your fields and then planting, setting up the irrigation and running water. In general, if I can water it twice for 2-3 hours each time that is enough in the fall to establish it and get it going pretty well and not water it again. The time commitment to manage cover crops is significant. They need to be terminated at the right time and trying to do this so they break down a bit before planting the next crop is challenging. Mowing and plowing are stressful additions to everything else you must do.

The thought process on cover crop needs to be that the cover crop is a top priority. This is so hard to do, to put off current profit for future fertility. In the fall, there is too much to harvest and it is time to make your money as a farmer. But wait, no, it is time to cover crop! We work hard to get blocks of crops cleaned up and replanted as quickly as we can. We are not always successful but we have the tractors, equipment, and people to do it. Getting your cover crop in on the planned dates makes a huge difference. You are planting next year's fertility. You can mess it up, but then next year's crops suffer. Again having the right set of tools to quickly get the cover crop planted and watered are critical or it won't get done .

Plant early. Don't wait until November. Don't take it out too early in the spring. It is recommended that 12-14 inches tall is optimal. I go with bigger is better. However, on corn fields they see a decrease in this year's crop if the cover crop is too big, because as it breaks down, it takes the available N. For veg farmers like us, the slight decrease in yield this year is often just that the crop takes longer to mature, but we still get the same amount of food. Lettuce studies in California have found that organic lettuce grows slower and the farmers get one less cutting per year than conventional lettuce.

We try to plow most ground about once a year to control perennial weeds: thistle, dock and bindweed. Cover crop has significantly decreased some of these weeds in our fields. When the weed comes up in the spring and is already being shaded out by cover crop and then a bit later gets plowed under and must start again, and then when it comes up it gets cultivated then the ground is replanted to cover crop, then the weeds start to struggle.

On most veg farms that are trying to grow intensively, managing fertility is very challenging. On our farm, we are not trying to be intensive. We are trying to rest 1/3rd to 1/2 of our ground each season. When we plant cover crops we go with high seeding rates. If you are going to all the trouble to grow a cover crop, establish a good stand, fix N and smother weeds, then lightly seeding is a foolish savings.

Planting a cover crop fixes the N problem and improves soil tilth. Make sure to inoculate nitrogen fixing plants such as peas and clover. They need to work with the symbiotic bacterium (Rhizobia) that actually fixes the N. These bacteria are probably not naturally occurring in your soil. Inoculating cover crop is easy and should be done for the first 3 times you plant. After that, the bacteria remain present in the soil and I go to randomly inoculating. When we started, we inoculated our seed and there would be a few nodules near the seed. But now, after growing cover crops and adding inoculant, our soil has the beneficial bacteria and each pea plant has dozens of nodules.

I usually plant a grass (rye, barley, or oats) with legumes. I know they say to add more diversity, but each addition adds management challenges and many of the cover crops are hosts to pests such as flea beetles, cabbage loopers, harlequin beetles etc. The grasses fix tilth and the legumes add N. Most info on growing cover crops is suggestions for conventional corn soy rotations where they don't have the same pest problems and will use herbicide that will kill any volunteers or cover crop that went to seed. It is easy for veg farmers to have the cover crop escape and become a weed in our fields.

One cover crop won't fix everything. There are some added challenges to cover cropping such as attracting wildlife from deer and elk to huge flocks of geese. Dealing with food safety and animal manure now becomes a concern. So cover crops are not a complete solution, but I like plowing it all under as a good way to make sure crops are not in contact with wild animal manure in the following season.

It is so easy to overlook watering cover crop or say things like 'It's just cover crop!' Prioritize cover cropping since it is what is going to make your next crop profitable.