ORGANIC PRECISION FARMING

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Several years ago, I got into conversation with a big conventional Midwest corn and soybean farmer at a meeting. Looking disdainfully at me, he declared "I am into production agriculture!" I kindly commented that any farmer not into production agriculture these days wasn't likely to be a farmer for long. Then, slightly irritated, he puffed himself up a little larger and stated decisively "I practice precision farming!", obviously with a certain image of a 'typical' organic farm firmly in his mind.

Sorry, Bud, our tractors are probably just as big as yours, equipped with all the same bells and whistles. But to us, that is not precision farming, that is simply using electronics and expensive



consultants to make the decisions that farmers, equipped with observation, intelligence and experience, should be making. We contend that organic farming in general is actually far more precise than most conventional precision farming. But precision organic farming, as we will describe it in a moment, is something that organic farmers should adopt, regardless of the size of their farms or of the sophistication of their equipment. Electronics can be very useful, but they can not take the place of the farmer's brain.

A consultant friend tells us that increasingly, many of the farmers he works with only get out of the tractor cab when something breaks or they get stuck. They have lost intimate contact with the soil, the plants, the weeds, the myriad of organisms who live in the soil. Machines and electronics simplify their ability to control but not to necessarily to work with nature. This must not be where organic farming is going. Organic farming requires the

farmer to be a better farmer, a more observant farmer, a farmer who practices careful agronomy and conscientious animal husbandry. That's the way the organic system works, and we don't have chemicals to patch up the mistakes.

So, what is precision organic farming? We will list a few ideas we are thinking about right now, as we are in the thick of the planting and weeding season. No doubt you will be able to think of more as the season goes along. Our email address is at the end of this article - maybe you can help us compile a working list of other things that precision organic farming must encompass for reliable success.

PRECISION EQUIPMENT OPERATION

We could spend a lot of time talking about precision adjustments for plows, tillage implements, grain drills, and combines. European farmers are getting double the small grain yields than what we in the United States generally get mainly because of their attention to every minute detail that goes into producing the crop. For the sake of space, we will use adjustment of the corn planter as one example of the importance of precise equipment operation.

At our April New York Certified Organic meeting, we were treated to a valuable presentation by Andy Zalar of the Precision Planting Co. in Tremont, IL on adjusting and maintaining corn planters for maximum performance, accuracy and uniformity. The corn planter is a complex machine with many moving parts that must work together precisely for optimal seed placement and coverage. Andy demonstrated techniques to check whether the corn planter is level and whether all parts are properly aligned, not worn and in correct adjustment. Worn chains and sprockets may be working improperly long before they actually break. Andy spoke of how seed opener disks determine whether the seed falls where it is supposed to, and how the coulters, firming wheels, and depth wheels must be set correctly for accurate planting. Metering units should be taken apart and cleaned, the planter should be checked for broken fingers and brushes, the elevator belt should be checked for cracks and flexibility. Retrofitting with shoes, firming points, specially designed seed tubes or 'ecentrically' (on an angle) bored gauge wheel bushings will often result in more uniform seed placement than what the planter had when it was new. Trash wheels in front of the gauge wheels will sweep away clods and stones, making for a level surface and therefore uniform planting.

Why is this so critical? Our good friend and long-time seedsman Art Scheele says that you can make more money at planting than at any other time of the year. Of all the money spent producing a crop, quality planting is THE best investment to give a good return. Differences in planting corn can result in a 3-8 bushel/acre spread in yield, and in a poor year, the difference can be even greater. Art says that too often, planting is one of the last things farmers think about. Frequently planters are not maintained, worn parts are not checked and replaced, farmers try to run their planters too fast, they don't calibrate them under real field conditions, and rarely do they get off the tractor, dig in the soil, and see whether the seeds are actually going where they want them to.

Depth control is probably the most critical factor in planting, whether you are using a fancy state-of-the art John Deere planter or planting by hand in the garden. Seeds of all species have an optimal depth at which they germinate best, depending on soil conditions. Differences in depth can result in a 20% difference in yield and have a profound effect on time of emergence and seedling vigor and health. A seed planted too deep will emerge slowly, vulnerable to attack by fungi and insects for a longer time. A seed planted too shallow will not form an adequate root system. A half-inch difference in depth can result in seedlings emerging one day later, while a difference of 2 inches can make a 2 day difference in emergence, more if conditions are poor. A corn plant emerging significantly later than its neighbors will never grow as well, its growth suppressed by larger plants, and it will essentially become a weed in the field.

We organic farmers must achieve uniformity in emergence as much as possible for effective weed control. Since timing is everything when it comes to effective mechanical weed control, we must have crops that emerge vigorously and uniformly to get our timing of all subsequent field operations right.

PRECISION OBSERVATION

There is old saying, perhaps largely forgotten in this modern era of GPS, on-board computers and climate-controlled tractor cabs, that the best fertilizer for a field is the farmer's footprints. Regardless of the electronic gadgets your tractor is equipped with, nothing quite equals to your own observations and experience. There is no electronic replacement for really looking at the



fields as you work them, making notes of where there are particular weed problems, crop growth differences, fertility imbalances, drainage problems, or big rocks. The real heart of precision farming is observation - YOUR observation - and your ability to figure out what those observations mean.

It is important to make connections between what you do in a field and what the results are. We recently heard on NPR Radio that the American media assumes that most

Americans have a memory span of about 10 days. Past 10 days, they figure that you may remember the big events but not the details. As organic farmers, we must have a longer attention span than that. We must remember where a field was plowed too wet - the damage can last for years, or where the cover crop was particularly lush - this may have added extra nutrients and microbial diversity. When yields are particularly high or disturbingly low or when certain types of weeds proliferate, we need to start making possible connections between what we did 6 months, 1 year, even 10 years ago, and what the outcome now is. But it is mighty hard to remember all this if you don't write it down.

PRECISION TIMING

Sometimes you can learn more from a bad situation than from when things go well. The year 2000 was like that for us. As the spring moved into summer, the rain just wouldn't quit, days and days on end. In a frenzy to get the corn planted and weeded in the few clear days between showers, Klaas worked later and later at night, sometimes to 3 AM or more, planting into soil he knew was not fit, but what choice did we have, the weather wasn't letting us do things right. This siege pressure did result in most of the acres getting planted as planned, but the stress on everyone was enormous, and harvest time showed us something even more discouraging. Sheer determination to get the seeds in the ground had not been good enough, yields were low, and longterm damage to our carefully tended soils was painfully evident.

All crops have an optimal time when they should be planted. Once you get out of this optimal planting window, plant vigor and yields will suffer. In New York, barley needs to get in by the first week of May, oats should be planted by May 15, corn should be all in the ground by June 7. If the ground isn't fit or if the particular crop is outside its optimal window of when it should be planted, sometimes we simply are better off not planting it.

We now know that when we reach the end of the optimal planting window for a particular crop, we should move on to the next one, even if all the acres we had planned are not planted yet. If the spring planting season ends and still not all the acres are planted, it will soon be August and time to start planting the winter small grains. We found that when we focused exclusively on getting corn planted, regardless of how late it got, we didn't manage to get the soybeans planted during their optimal planting window, which in turn prevented us from planting sweet corn at its optimal time etc. We would have been far better off calling it quits on corn when it got too late, keeping all the other crops on schedule. Also, when the frenzy to plant as many acres as possible means that weed control operations are not done on time, maybe we need to re-prioritize our labor and maintain a smaller acreage in better condition.

Crop insurance is now available for organic farmers for many crops. If you carry crop insurance and you get out of the optimal planting window for a particular crop, perhaps it is better to collect a 'prevented planting' payment rather than to plant the crop when it shouldn't be. You certainly won't get rich on crop insurance payments, they generally pay at conventional commodity prices, but they should cover your out-of-pocket expenses.

The core of making precision timing work is the idea that diversity spreads out risk and labor. If you are only growing corn and soybeans like many conventional farmers, then corn and soybeans must go in, regardless of the weather. Organic farmers must have more crop diversity than that and there are good markets for a wider range of organic crops. The more crops you have on your farm, the more likely you are to hit the proper planting window correctly for each crop and spread the work out to avoid stressful labor crunches. Diversity also gives some protection against adverse weather extremes. We're seeing that this spring which is cold and wet. To be sure, we would like to have more corn planted by now, but we are watching with pleasure the small grains burgeoning. This may not be corn weather, but it certainly is barley weather! Klaas remembers some old peasant wisdom from his father's part of Germany, Friesland, which essentially says "when hay spoils, cabbage grows". A diversity of crops spreads risk - the more you have, the more likely it is that at least one of the crops will thrive, regardless of what the weather brings.

UNEXPECTED WINDFALLS

So, what if the weather is uncooperative and all the cover crops don't get plowed like you had planned. What then? Sometimes there are unexpected opportunities that you may find



remarkably profitable. Unplowed cover crops, especially clover, rye and hairy vetch, can actually be saved for a seed crop. With the new NOP requirement that organic farmers must use organic seed, there is a strong market for organic cover crop seed. Clover will generally make a better stand of seed off the second cutting, so if you are leaving clover in the field, mow it in June and then be prepared to harvest clover seed in late July. At about \$1.25/bu., a good yield of clover seed can sometimes actually be more profitable than a crop of corn!

CHOOSING CORN

The new NOP organic seed requirement is causing some major upheavals among organic corn farmers. Suddenly the familiar terrain is changing and the choice of varieties for which there is certified organic seed seems exotic and rather scary. What are our choices in 2003 and beyond?

Hybrid corn - this year there are a handful of companies selling organic hybrid corn varieties,



mostly developed for Midwest conditions. The price is high and there doesn't seem to be much choice for areas like most of New York, that need a 90 day corn or less. This situation is changing, more seed companies are recognizing this profitable organic niche and by 2004, you are likely to see greater selection and lower prices.

Open Pollinated corn - these are older varieties and unlike hybrids that are highly uniform, OP corn varieties consist of a wide assortment of types varying in height, yield,

standability, and other traits. Also unlike hybrid corn, you can select within a population for types that do well under your conditions and save your own seed. Over time, it is possible to get a fairly uniform, high yielding OP line, but if you buy OP seed from another area and are expecting hybrid performance, you may be disappointed. In general, many people report that their OP corn works best for silage, it seems to be more nutritious, but it does not have the same standability or grain yield of hybrids.

Other Alternatives - we are working with Cornell University corn breeders to test other types of corn that may have value. The Cornell folks have a large trial of their most promising lines out on our farm this year to test their performance under organic conditions. One corn type they have introduced us to is called a 'synthetic', which is a deliberate mixture of a number of similar, improved lines that can be allowed to intercross in the field. Like an OP, the seed can be saved and re-used, but it is a more stable and improved population than a typical OP. We'll keep you posted on its progress!

RAINY DAYS

OK, sometimes it rains. Rainy days can be just as necessary in the precision organic farming process as the warm sunny ones. This is the time to catch up on necessary record keeping, rethink planting plans, repair and maintain machinery, talk to your banker and keep her up-to-date about what is happening on the farm, talk to your seed supplier and crop insurance agent, get re-organized and re-prioritized. It is a good time to check labels and be sure that all your inputs meet organic standards. Several years ago on a rainy day, by sheer luck, Klaas checked labels on a pallet of untreated alfalfa seed that we'd just gotten in. To his surprise, stapled to back of the main seed tag was another tag stating the seed had been pre-treated with a Rhizobium inoculant - a genetically modified inoculant. He immediately phoned our seed supplier who was able to replace the seed, but some farmers in the organic community were not so fortunate. They planted the pre-inoculated alfalfa seed and are still living with the serious certification consequences. Take time to read labels! Sometimes they really can surprise you and they don't always say what the smooth-talking sale-person promised!

Rainy days are also a good time to relax, spend time with family and friends, and to recognize that stress management is absolutely necessary, but it is all too often neglected on a farm. Several of the high profile farm sales in this area during the winter were not because the farms failed, they were because the owners were divorcing. Regardless of your religious persuasion, taking one day off a week, even if there is work to be done and the sun is shining, makes very good sense. Farming is a great way of life . . . but only if it truly is a great way of life for everyone involved. For precision organic farming to be successful, all members of the farm must be working together, appreciating what everyone else is doing to contribute to the success of the farm and wanting to be there. When this isn't the case, all the GPS and computer monitors in the world won't help.

AND FINALLY ...

About a month ago, Klaas called me on the cell phone, his voice slightly shaking, and asked if I could maybe come out and drive him over to the hospital emergency room, that his hand was 'a bit messed up'. While hooking a drag to the tractor, the drag hitch over-centered and came down unexpectedly fast, slicing deep into his finger and cutting a tendon. The doctor fortunately was able to make the necessary repairs, and with time and exercise, it will be fine. But since then we have heard a remarkable number of stories from friends about lost fingers, arms, legs and lives, of paper-towel-and-duct-tape 'first aid' jobs that resulted in serious infections, and of many many close calls. Farmers are notoriously hard on their appendages! For precision organic farming to work, we need to keep our farmers productive and unharmed.

So folks, as spring turns to summer and things get really busy, be careful out there, we need all of you - intact!