

# CROP TALK

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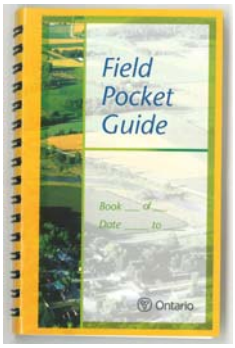


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## Targeting the Right Wheat Acres!

*by Peter Johnson, Provincial Cereal Specialist, OMAFRA*

The leap year rule prevails! High prices drove growers to look for every available acre to plant wheat on. Then, after an incredible start to the 2008 season, Mother Nature delivered her normal leap year package of the weird, wild and wonderful. Repeated frost in May, hail in June, and right about harvest, it started to rain every day. Add to this sprouts, mildew, fusarium, black point, and ergot. Leap years! Given all these frustrations, it's a wonder growers are even considering planting wheat this fall. But in the majority of cases, yields were good, the final quality better than expected, and we like to grow wheat! However, the lessons learned from 2008 should be heeded. Growers should refocus to plant the right acres, not just every acre.

**After Beans**
Whether after edibles or soybeans, this is a no brainer. JUST DO IT! The downside this year will be late harvested beans resulting in late planted wheat. That means lower yield potential. Still, this rotation works!

**After Canola**
You don't even need to ask. Planting can be early, the rotation is right, yield potential is awesome. Why wouldn't you?

**After Silage Corn**
Ouch! This one was ugly this year, at least for many growers. While the bulk of the winter wheat crop made grade 3 or better, the fields that were "feed account fusarium" could often be traced back to this rotation. So there is a risk. The upside - fusarium is the only risk, and you can often plant early on silage ground. Two management "musts" in this scenario:

- use a variety that is MR for fusarium (www.gocereals.ca), and
- spray with a fusarium fungicide.

Most years, this will be enough to get you quality wheat, and high yields to boot.

**After Hay**
Wheat after alfalfa works. But why you would waste the nitrogen credit for corn (100 lbs/ac) for the credit on wheat (50 lbs/ac)?

Wheat after grass hay is a big risk because of Take-all. A root disease that infects in the fall, Take-all can rob 50% of your yield or more. In 2008, there was definitely significant Take-all in these fields. Yield impact is an estimated 10 to 30% loss. Management options in this situation are limited. Try not to plant early because the Take-all has more opportunity to infect. Using potash as a seed placed fertilizer provides some Take-all suppression. But it is still a risk!

**After Oats**
Surprisingly, wheat after oats is not a bad rotation. Very few of the diseases cross over between oat and wheat. Go for it!

**After Barley**
Wheat after barley is quite different than oats. Many of the root diseases cross over between barley and wheat. This is only a fair rotation at best. Management options are the same as with wheat after grass hay. Don't plant early, and use seed placed potash.

**After Wheat**
This is the worst choice of all. Leaf disease and root disease pressure will be at its maximum. You will need to spray for leaf diseases. Take-all, Eyespot and Cephalosporium stripe are all risks that there is no way to manage. Count on a minimum of a 10% yield loss. In 2008, some wheat on wheat fields had over 30% Take-all infection. Know the risk!

**Soft White**
How many times do we need to sing this song? If the premium for soft white looks intriguing, remind yourself of the risk of sprouts! Be sure you add in drying costs to your calculations. Successful soft white growers don't wait for dry wheat. Finally - DO NOT grow more soft white than you can combine in two days. Period.

Does all this mean we planted too much wheat in the fall of 2007? **NO**! With over 2 million acres of soybeans, there is lots of opportunity for more wheat. We just have to get those beans harvested in decent time! Plant WHEAT!!

## How Little Fertilizer Can You Get Away With For Wheat?

*by Keith Reid, Soil Fertility Specialist & Peter Johnson, Cereals Specialist, OMAFRA*

Record fertilizer prices have many farmers asking how little they can get away with, or whether they should be applying fertilizer at all? The answer would be simple if every field responded to fertilizer in the same way. The reality of agronomy is that response to any input is variable, so we are always playing the odds. Fortunately, it's a gamble that pays back more often than not. However, we should be managing our fertilizer program to pick a winner as often as possible. It is doubly important this year, because grain prices are also very attractive. You don't want to miss out on opportunities for increasing yields.

**Short Term Considerations - Starter Response**
Winter wheat is very responsive to high levels of phosphorus near the seed. Unless your soil tests are way up there, you can expect a kick of 3 to 7 bushels from starter fertilizer. The amount you need to add to get this increase must be high enough to raise the concentration in the seed band, but it only needs to carry the plant until it has a well established root system. Don't go any lower than 15 lbs/ac (17 kg/ha) $P_2O_5$ as a starter - 30 lbs/ac (34 kg/ha) of MAP, 5 gal/ac (11.3 litres/ha) of 6-24-6, or 3.5 gal/ac (39.4 litres/ha) of 10-34-0.

**Medium Term Considerations – Meeting This Crop's Requirements**
A winter wheat crop with a well established root system can pull enough P and K out of the soil to carry it through to maturity, IF there is enough in the soil to start with. If your soil test is low for either of these nutrients, then it will pay you to add them as either fertilizer or manure. You can do this by broadcasting, or by increasing the amount applied through the drill. Watch out for the maximum safe rates, which are 13.5 lbs/ac N (15 kg/ha) or 27 lbs/ac N + K (30 kg/ha) of N+K if all of it is going to be banded.

**Long Term Considerations – Crop Requirements Over the Rotation**
A 100 bushel wheat crop will remove about 60 lbs/ac (68 kg/ha) of phosphate and 35 lbs/ac (40 kg/ha) of potash. If the straw is removed it will remove 70 lb/ac (79 kg/ha) phosphorus and 120 lbs/ac (135 kg/ha) of potash. If you rely solely on only 15 lbs/ac (17 kg/ha) of $P_2O_5$ in your starter, your soil fertility levels will eventually decline. You will need to assess for your own farm whether there are other sources of nutrients that will help to make up this shortfall, or where it makes the most sense for you to be operating on the scale from build-up to drawdown of soil fertility.

It still makes sense to use low rates of starter fertilizer on wheat. Even at current phosphorus prices, yield increase will often cover the cost of these applications. Long term, consideration must be given to the soil bank account, and what strategy will keep high yields coming down the road.

## Controlling Alfalfa in Minimum Till Cropping Systems

*by Mike Cowbrough, Weeds Specialist, OMAFRA*

Retiring an established alfalfa crop in minimum tillage cropping systems can be challenging. Often the biggest reason for poor control of an old alfalfa crop is that the appropriate herbicide rate is not used and the timing of application is not optimal.

**Treatment Options and Rates**
Glyphosate (eg. Roundup Weathermax, Touchdown Total) is the most common active ingredient used for control of alfalfa. However, producers have observed that glyphosate applied alone will sometimes offer inconsistent alfalfa control and the addition of 2,4-D Ester improves control.

Demonstration trials at Kemptville College (University of Guelph) in 2008 provided a comparison of different glyphosate tank-mixes compared with glyphosate alone. Over two hundred participants at the Eastern Ontario Crop Diagnostic Day were asked to select the treatment which they felt provided the best control of alfalfa. The tank-mix of glyphosate + 2,4-D Ester proved to be the winning treatment (Table 1 and Figures 1,2 & 3). Glyphosate applied alone will often result in re-growth the next spring, particularly when low rates (i.e. 0.67 L/ac) are used.

**Table 1.** Control of established alfalfa 4 weeks after application with several glyphosate tank-mixes.

| Treatment | Rates | Votes | Control |
|---|---|---|---|
| glyphosate (540 g/L) | 1 L/ac | 0% | 70% |
| glyphosate (540 g/L) | 2 L/ac | 44% | 90% |
| glyphosate (540 g/L) + 2,4-D Ester (564 g/L) | 1 L/ac + 0.5 L/ac | 52% | 90% |
| glyphosate (540 g/L) + amitrole | 1 L/ac + 1.68 L/ac | 4% | 80% |
| Guardian (glyphosate + Classic) | 0.67 L/ac + 14 g/ac | 0% | 70% |

Source: Quesnel, Banks and Cowbrough, 2008

Figure 1. Visual control of alfalfa 4 weeks after an application of glyphosate (540 g/L) at 1 L/ac.

Figure 2. Visual control of alfalfa 4 weeks after an application of glyphosate (540 g/L) at 2 L/ac.

Figure 3. Visual control of alfalfa 4 weeks after an application of glyphosate (540 g/L) at 1 L/ac + 2,4-D Ester (564 g/L) at 0.5 L/ac.

Figure 4. Untreated Control

**Table 2.** Visual Control of Alfalfa with Fall and Spring Applications of glyphosate and 2,4-D Ester in Ridgetown, ON.

| Treatment | Timing | Rates | Control |
|---|---|---|---|
| glyphosate (540 g/L) | Fall | 1.34 L/ac | 89% |
| glyphosate (540 g/L) | Spring | 1.34 L/ac | 60% |
| glyphosate (540 g/L) + 2,4-D Ester (564 g/L) | Spring | 0.67 L/ac + 0.85 L/ac | 98% |

Source: J.E. Shaw and R.H. Brown, 1989

**Application Timing - Fall or Spring?**

Fall glyphosate applications provide significantly better control of alfalfa than spring applications (Table 2). If a fall herbicide application cannot be accommodated, then the addition of 2,4-D Ester to glyphosate in the spring will improve control (Table 2). The limitation of applying 2,4-D Ester with glyphosate in the spring is that on the current glyphosate label, you are limited to planting only spring cereals, not underseeded to legumes and at a 14 day pre-plant interval.

The University of Guelph recently published the results of a 3 year study which evaluated pre-plant 2,4-D Ester applications to soybeans. They found that applications of 0.5 L/ac of 2,4-D Ester (564 g/L) applied 7-14 days pre-plant caused no crop injury and grain yields equivalent to the weed-free control plots[1]. However, this application timing is currently not listed on the glyphosate label.

**Summary**

- Fall herbicide applications provide the best control of alfalfa in minimum tillage cropping systems.
- The tank-mix of 2,4-D Ester + glyphosate applied to alfalfa in the fall often improves control and reduces the likelihood of re-growth in the spring.

[1]Soltani et al. 2008. Effect of amitrol and 2,4-D applied at the preplanting and pre-emergence of soybean. Weed Biology and Management. Vol 8. pp 139-144.

## Soil Testing Myths

*by Keith Reid, Soil Fertility Specialist, OMAFRA,*

There are a number of misconceptions floating around out there that keep us from getting the best value from soil testing. In some cases, they mean that samples don't get collected at all. This is a total waste of valuable information you could use to improve your bottom line.

Myth - **My farm is unique, so a soil test can't be relevant.**
Fact - While it is true that there are differences from farm to farm in how effectively nutrients are used, the soil test is the only reliable way to get information about the concentration of nutrients in your soil. You can manage your unique situation better if you have this information.

Myth - **You have to grid sample to get good information.**
Fact - We are more aware of within-field variability today, but the value of quantifying this variability is limited. The first step should always be a good field scale sample (maximum 25 acres).

Myth - **I grow good crops, so I don't need soil tests.**
Fact - Good for you! This probably indicates that nutrient deficiencies are not a problem, but that there may be opportunities to save money with lower fertilizer rates on some fields.

Myth - **Water is the best extract, because it shows what is immediately available to the crop roots.**
Fact - This is one of those attractive theories that just doesn't work in reality. The water extract, despite the claims, is not at all the same as the concentration in the soil solution. This is because it involves shaking a soil sample in a soil/water

slurry, that is a much higher amount of water than a root could ever grow in. It also ignores the contribution of exchangeable and slightly soluble nutrients from the soil, which account for most of the plant uptake during the growing season.

Myth - **Other provinces/states use "better" extractants.**
Fact - Soil test extraction is a complicated dance between the chemistry of the soil and the extractant, in an attempt to mimic the availability of nutrients to the crop over the growing season. The extractants chosen for Ontario work well with our soil types. Others are better suited to the conditions in their particular areas.

Myth - **Fertilizer recommendations from soil tests are only for average crops.**
Fact - Soil fertility is only one small part of growing high yielding crops, and crops with a high yield potential will have large root systems that are very efficient at absorbing nutrients from the soil. Fertilizing using soil test recommendations will not limit crop yields.

Myth - **The soil test reports are too hard to understand.**
Fact - Soil test labs are trying to add more value to the soil test by including more interpretations of the results on each report. Unfortunately, this does sometimes have the effect of making the important information harder to find. School yourself to concentrate on a few key numbers (soil pH, extractable P, K & Mg), and interpreting the test results becomes much simpler.

## Soil Management Tips For Late Summer and Early Fall

*by Adam Hayes, Soil Management Specialist – Field Crops, OMAFRA*

1. **Scout fields for soil erosion.**
   - The heavy downpours or significant rainfall on already saturated soils this year caused soil to move.
   - Before pulling the combine into the field this fall, check fields and along ditches for small gullies and washouts. Be on the lookout for tile problems.
   - Assess the situation for causes of soil erosion to determine if management changes (such as more residue cover) are required, or if an erosion control structure is needed.
2. **Be aware of soil compaction problems.**
   - Rainfall events during cereal harvest this summer often meant that the combine and grain buggies were traveling on the field in less than ideal conditions.
   - This lead to rutting and compacted areas in the field.
   - Assess the compaction in these areas and consider management options.
3. **Consider options for preventing soil compaction.**
   - Many soils may be wetter going into the fall this year, so more prone to soil compaction.
   - Refer to the soil management www.omafra/crops for more information on the detection and prevention of soil compaction.
4. **Don't use deep tillage if you don't have a problem.**
   - If soil compaction has been confirmed and not too deep, deep tillage may be able to correct it.
   - This year, soils may be too wet for deep tillage to be effective. Check soil moisture to the depth of tillage to determine if it is dry enough to shatter.
   - Research has shown that if there is no compaction, deep tillage will not increase yields.
5. **Manage the soil to increase or maintain organic matter levels.**
   - Organic matter is the most important part of the soil.
   - Organic matter plays an important role in soil structure, nutrient cycling and availability, water holding capacity, and drainage. All of these can impact yield.
   - Add organic matter through the addition of manure, biosolids, composts, crop rotation, and cover crops.
   - Minimize organic matter loss.
6. **Avoid excessive tillage of cereal stubble.**
   - If you plan to no-till into wheat residue, cutting the straw short and removing it will improve results.
   - Growing cereals in the rotation improves soil structure and adds much needed soil organic

matter. Manage the residue to help prevent erosion, and also so the soil will dry and warm up in the spring without losing much organic matter or soil structure.

- Disking or strip tillage are a good compromise option.
- Moldboard plowing or chisel plowing and the associated secondary tillage can undo a lot of the good from the cereal crop. Excessive tillage of any kind depletes organic matter and leaves the soil exposed and prone to soil erosion.
- On the other end of the spectrum, some growers have had success with only coulter tillage.

7. **Manage red clover wisely.**
   - Try to leave the red clover until the end of September or early October for the most benefit.

## Tips For Making Marketable Hay Without Rain-Damage or Mould

*by Joel Bagg, Forage Specialist, OMAFRA*

The year 2008 will long be remembered as the year when it was almost impossible to make dry hay without getting some rain on it. With almost daily rains and lack of sunshine, suitable hay making weather "windows" were either extremely narrow or non-existent. Rain-damaged hay is typically lower in soluble sugars and higher in fibre, discoloured, mouldy, dusty and less palatable to livestock. Hay baled "tough" also presents the risk of heating in storage. "Horse quality" hay made without rain-damage or mould is extremely short in supply, and trading for very high prices.

Fast drying of hay in the field is the goal. The obvious benefit is to get the hay successfully made and under cover before the next rain. Fast drying also minimizes respiration losses, microbial growth in the windrow, and maximizes sugars, green colour, and palatability.

There are many different ways to successfully make quality hay. Even so, some hay producers are more successful than others. These craftsmen apply the "art" as well as the science of hay making. If you look around the province, you can observe hay producers that focus on quality for horse hay and other export markets. Watch closely what these pros are doing that others are not, that makes their batting average higher when it comes to making a premium hay product. It is all about attention to details. Here is a short list.

**Hay Making Capacity**
Hay making technology has changed a great deal to give us the capacity to cut, rake, bale and store a lot of hay when the weather windows of opportunity present themselves. The pros have that capacity.

**Cut A Wide Swath**
Leaving the swath as wide as practical takes the maximum advantage of the drying effects of the sun and wind. Narrow swaths take longer to dry. Humidity inside a tight, narrow swath is very high and not conducive to fast drying. Most haybines have an easy swath width adjustment. Some of the pros go as far as setting their tractor tires as wide as possible to avoid driving on a wide swath.

**Proper Conditioning**
Proper maintenance of both roll and flail conditioners is important to ensure adequate conditioning, without over-conditioning. Check your Owner's Manual. Rubber rolls wear with use and eventually under-condition if not adjusted. In a survey done in the machine sheds of some Wisconsin hay producers, half of the conditioners exceeded the maximum roll clearance spacing required for adequate conditioning.

Some of the pros also use more intensive super conditioners, macerators and reconditioners to achieve more aggressive conditioning and faster drying. This also results in a softer textured hay. A super conditioner, replacing the need for a conventional conditioner, uses adjustable airbags with high pressure rubber rolls to crush the stems their full length, rather than crimp and break the stems every 2-4 inches. Macerators and reconditioners are used after initial drying with another trip around the field to achieve further conditioning.

**Strategic Raking**
The rotary rake seems to be the standard tool for windrow management used by the pros. Parallel bar and wheel rakes tend to result in "roping" and don't break up clumps and provide as much

fluffing effect as a rotary rake. Tandem axle rotary rakes ride the ground more evenly with less contact with the ground. Raking at no less than 40% moisture minimizes leaf loss. Some adjust their rotary rakes to give a slower rotary speed, which also reduces leaf loss.

Tedders are sometimes used at higher moistures to speed up drying by spreading the crop over the entire surface area. Tedders can result in high leaf loss with legumes, but much less so with grasses.

Because leaf losses can be high when raking that "almost ready to bale hay", windrow invertors can be useful to gently move the bottom of the swath to the top to achieve that last bit of necessary drying.

**Make The Right Bale**
Small square bales fetch the highest prices per lb, but require a lot of labour or investment in handling equipment (accumulators and grapplers) to get them into storage. Small squares are somewhat limiting in their capacity to get a lot of hay made in a narrow weather window.

Large round bales are not as attractive to non-local buyers and are discounted in price, because they are more difficult and more expensive to transport. They typically don't move farther than a tractor and wagon can comfortably take them.

There is a growing market for large square bales. Large squares have the significant advantage of easier trucking to non-local domestic and export markets. They also have the advantage of giving the producer the capacity to make a lot of hay in a short period of time. A recent innovation is the reprocessing of a large square bale into small squares by hydraulically cutting and retying them. This combines the advantages of harvest capacity and mechanization of large squares with the market appeal of small squares.

**Propionic Acid**
Large square bales are more dense, so it can be very difficult to get this hay dry enough to avoid mould and heating without the use of propionic acid hay preservative products. For this reason, moisture sensors with computerized applicators are usually standard on large square balers. High application rates result in oxidization and browning that makes the hay less marketable. While there has been some resistance to propionic acid in the horse hay market, there is growing market acceptance, some of it from necessity.

**Under Cover & Off The Ground**
Getting hay stored properly is often a weak link in hay production. Large squares absorb moisture from the ground, so bales should come off the field the same day they were made. Bales should be stored under cover and off the ground. Skids or a layer of old hay can be used. Ventilation is important while bales lose their moisture to a safe level, so stacked large square should be stored with space between. To have good market acceptance, bales should be green on all sides, so avoid sun bleaching. "Green sells hay" is a market reality.

**Forage Focus**
The topic "The Craftsmanship Of Successful Hay Making" will be discussed in more detail by Fritz Trauttmansdorff, Dunlea Farms, at this year's Forage Focus Seminars, sponsored by the Ontario Forage Council. Forage Focus is tentatively scheduled for December 2nd at Winchester and December 3rd at Shakespeare.

## Understanding Pasture Gains in a Wet Year

*by Jack Kyle, Grazier Specialist, OMAFRA*

In a year with plentiful rainfall, pastures remain lush and continue to grow throughout the summer. It is always encouraging to see green grass in August, rather than having all fields brown and needing to feed hay. Pasture gains in these wet years are often a little disappointing. One would think that with all the lush grass and high quality feed available all season, gains should be excellent, but this is not necessarily the case.

To understand why this happens we need to look at how an animal eats on pasture. Cattle bite at about 15 bites per minute for 6 - 10 hours per day. Body fill is the main factor determining when they quit eating. In a year with adequate rainfall, the dry matter (d.m.) content of the grass is lower - likely in the 15 - 20% range. In a drier year, the grass may have a dry matter content of 20 - 25%. If an animal grazes for 8 hours per day at 15 bites per minute, this represents 7,200 bites each day (15 bites/minute X 60 minutes X 8 hours).

**Pasture Moisture Limits Dry Matter Intake**

As an example, a 400 kg animal on pasture requiring 2.5% of body weight in dry matter intake for maximum growth would need to consume 10 kg of dry matter per day. If each bite size is a typical 7 grams and this animal is going to take 7,200 bites per day, then it will consume 50.4 kg of pasture (7,200 bites X 7 grams).

If the pasture is 20% dry matter (typical of a normal year), this 50.4 kg represents 10.8 kg of dry matter and the animal has met their nutritional needs.

If this pasture was lush and had 15% dry matter (typical of a wet year), then our beast would consume only 7.5 kg of dry matter (50.4 kg X 15% d.m.). This falls short of its dietary needs. Under this scenario the animal needs to consume 66.6 kg of pasture to meet their optimum needs. This means either eating for longer (more bites), or not meeting its energy needs and having less than optimum growth.

In a dry year, when the pasture would have 25% dry matter, this same animal would consume 12.6 kg of dry matter (50.4 kg X 25% d.m.), well above the requirement of 10 kgs. This animal could either graze for fewer hours and still meet its requirements, or graze for the same time and have exceptional gains.

In a wet year it takes more hours of grazing to meet the dietary needs than it does in a dry year, assuming adequate forage is available.

**An Analogy**

To see this in another way, it is like sitting down to a meal that is a big bowl of soup. Across the table from you is a person with a bowl of stew. You both have the same sized spoon. Who is going to feel full or satisfied first? The person eating stew will. Can you get enough nutrition from the soup? Yes, but only if there is a second or third bowl offered and you have longer to eat your meal.

## Copper on Winter Wheat Project

*by Scott Banks, Emerging Crop Specialist, OMAFRA*

The application of copper has been promoted to improve disease resistance of wheat, and ultimately to improve grain yield and quality. In 2008, the Quinte Regional Soil & Crop Improvement Association initiated a project to evaluate the use of foliar applied copper with the herbicide on winter wheat for cereal leaf and grain

**Results**

**Table 1** – Yield Effects of Foliar Copper Application on Winter Wheat (Quinte Regional Soil & Crop Improvement Association, 2008)

| Site | Soil Test pH | Organic Matter % | Soil Test Cu (ppm) | Leaf Analysis Copper (ppm) | Leaf Analysis Calcium (%) | Variety | Treatment | Treatment Average Yield @14.5% (bu/ac) | Difference Yield @14.5% (bu/ac) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.5 | 3.9 | 2 | 8.34 | 0.76 | Emmit | Copper | 73.8 | |
| 1 | 7.5 | 4.4 | 2 | 7.93 | 0.77 | Emmit | No Copper | 82.9 | -9.1 |
| 2 | 5.5 | 3.5 | 1.3 | 6.46 | 0.59 | Pioneer 25R47 | Copper | 34.3 | |
| 2 | 5.3 | 3.1 | 1.2 | 4.78 | 0.51 | Pioneer 25R47 | No Copper | 35.6 | -1.3 |
| 3 | 6.2 | 4.8 | 1.4 | 7.23 | 0.62 | Pioneer 25R47 | Copper | 64.5 | |
| 3 | 6.4 | 5 | 1.7 | 7.11 | 0.63 | Pioneer 25R47 | No Copper | 64.1 | 0.4 |
| 4 | 6.5 | 3.8 | 1.7 | 4.83 | 0.54 | Pioneer 25R47 | Copper | 105.3 | |
| 4 | 6.6 | 3.8 | 1.7 | 4.98 | 0.49 | Pioneer 25R48 | No Copper | 106.5 | -1.2 |

*Critical Deficiency Levels – a nutrient is deficient when the nutrient concentration falls below the critical level and would expect a yield response to applying that nutrient.

Soil Test Copper = 1 ppm (DTPA extractable. 0 - 6" depth)

Leaf Analysis Copper = 3 ppm

Leaf Analysis calcium = 0.25%

disease control, and to measure the impact on yield. Soil samples and leaf tissue samples were collected. Visual disease comparisons were made during the growing season.

**Summary**

Visual ratings taken during the growing season observed similar disease present on both the untreated and treated plots at low levels. The soil samples for copper were above the critical deficiency of 1 ppm at all the sites. Organic matter was generally high at all sites. From the leaf tissue analysis, both copper and calcium levels were above the critical deficiency levels. The 2008 yield results showed little to no advantage to foliar applied copper. For a quality comparison, grain samples are currently being graded and analyzed for toxin levels.

## Combine Cleaning Procedure

*by Hugh Martin, Organic Specialist, OMAFRA*

When harvesting organic crops it is very important to make sure the equipment is clean, especially when moving from non-organic to organic fields (for example custom operators). If possible, use combines that are dedicated to organic production only. If that is not possible, use combines that are dedicated to non-GMO crops. When that is also not possible, take the time (possibly several hours) to thoroughly clean out the combine. Here are some ideas:

1. Consult the Owner's Manual on cleanout procedures, access doors, component disassembly, and safety procedures.
2. Choose a suitable location for the cleanup.
3. Collect appropriate safety gear – eye protection, dust mask, gloves, hard hat, ear protection.
4. Evaluate appropriate cleaning equipment for each area - air compressor with wands, shop-vac, leaf blower, large tarp, broom/whisk broom/steel brush, screwdriver, and other tools as needed.
5. Run discharge auger two minutes, or until grain tank and auger are clean.
6. Drive combine across end rows to dislodge grain before moving to cleanout area.
7. Remove grain head making sure to safely secure the feeder house with cylinder stops.
8. Move combine to cleanout area.
9. Place tarp under combine to capture the grain being removed.
10. Inspect and clean cab roof.
11. Lower feeder house and clean inside and outside. Pay special attention to areas where grain or weed seeds may catch.
12. Raise feeder house and clean stone trap and remove all material.
13. Clean grain tank, remove grain from top and bottom augers, ledges, corners. Consider flushing unloading auger with other material, such as wood chips.
14. Clean the cylinder or rotor and concave threshing area and separating area by opening all access doors identified in owner's manual and removing all material.
15. Clean the straw walkers (if equipped). Open all access doors. If you must enter this area, consult owner's manual on safety precautions and use a rubber mat or carpet to lay on.
16. Clean tailings and grain elevators by opening bottom access doors and removing grain. Empty and cleaning the moisture sensor if equipped.
17. Clean the cleaning shoe area by removing chaffers and sieves for easier access, or opening and closing the sieves several times to loosen debris and remove grain. Access and empty lower grain cross-augers as far as possible.
18. Clean rear axle, chopper and spreader areas to remove all grain and plant debris.
19. Replace all safety shields, making sure all elevators have been reassembled and all doors and openings are closed and fastened.
20. Clean the grain platform by removing stems and grain from cutter area, under platform auger and reel. Check inside auger area via inspection plates if present. Clean under side shields.
21. Clean the corn head by removing all stalks, ears and loose grain. Lift shouts and vacuum to remove grain and other plant debris.
22. Consider flushing combine with the next grain crop to clean the unloading auger before collecting grain from the field.

(Adapted from Combine Cleanout Procedures for Identity Preserved Corn and Soybeans, Iowa State University, 2003.)