

Harvesting High-Quality Organic Grain

Part 3 – Corn

by Mary-Howell & Klaas Martens

Studies show that most consumers of organic products generally buy them because they perceive organic food to be of higher quality. It is imperative therefore for organic farmers to focus on producing and maintaining high-quality products. The days of organic crops selling easily simply because they are “organic” are over. There is too much supply to continue that luxury, with organic grain and beans coming into the United States from all over the world.

We must make sure that organic is never an excuse for selling moldy corn, buggy wheat, stained soybeans, checked red kidney beans. We must make sure that the organic products we deliver are of the highest quality.

In previous installments, we have discussed small grains and soybeans in detail. This month, the series concludes with a look at harvesting high-quality organic corn.

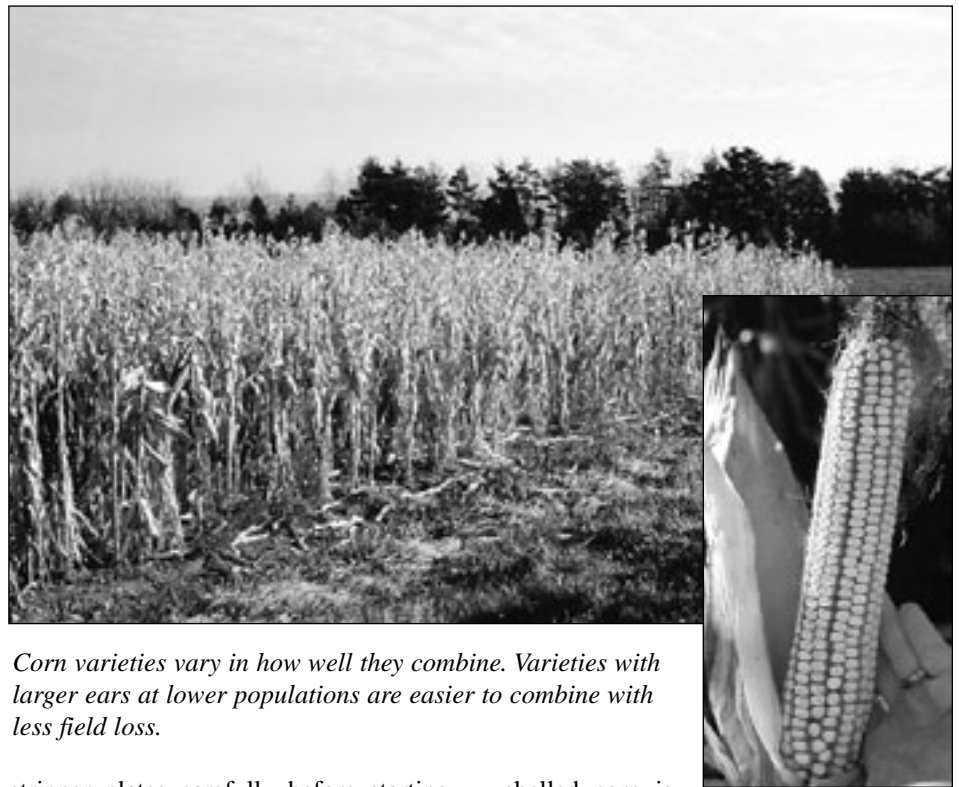
Food-grade soybeans are the premier crop at our farm in New York, so we put a lot of effort into producing high quality. But does the quality of our corn really matter if we are planning to sell it to the organic animal-feed market? Although the answer may depend somewhat on the demands of your buyer, quality *does* matter: it will affect your yield, it will determine how well your corn stores, and it will determine what market wants your crop.

PREPARATION

1. If you have an older combine, it is important to carefully inspect the machine before harvest, looking for signs of wear. Even with an older machine, you can do a very good job if you start with the settings in the user’s manual and then adjust to match field conditions. Setting a combine, any combine, is an art that requires experience

and observation. User’s manuals also have valuable troubleshooting sections that give suggestions on adjustments when there are problems.

2. The job starts at the corn head — when it is set right and in good repair, most of the separation of ear from plant will occur here, and the combine will do a better job and have more capacity. Worn-out snapping rolls won’t grab stalks as aggressively, and will allow a lot of leaves and stalk to pass into the combine. Examine the rolls, gathering chains and



Corn varieties vary in how well they combine. Varieties with larger ears at lower populations are easier to combine with less field loss.

stripper plates carefully before starting, looking for excessive wear and need for adjustment.

3. Check the machine carefully. Inspect rasp bars for chips, bends or cracks. Check also for worn-out chains, cracked belts, cracks or leaks around augers (get out the duct tape). Sharp,

worn-out auger flighting can damage grain and reduce capacity.

4. Worn and/or bent concave and cylinder bars are a major source of damage and loss. Any place where the distance between the concave and cylinder varies from the rest, significant loss can occur. A rock going through the system can cause this. The edges on a concave and cylinder bar are worn out long before they look like they are.

5. Make sure the machine is clean before it is stored and especially before starting harvest. Shaker pans are prone to accumulate trash, especially when there are green weeds, high moisture, or near freezing temperatures — check them and clean as often as needed.

HARVESTING

1. Be sure the crop is ready to harvest. Test for grain moisture before beginning. The ideal moisture for harvesting dry

shelled corn is 22-26 percent.

Field losses increase below 20 percent, but the cost of drying is reduced.

2. Combine engineers speak about finding your particular combine’s “sweet spot” — that optimal match of settings for a given crop condition that captures the most yield with the least damage. In an August 2002 *Successful Farming* article,

Iowa State ag engineers offered this advice:

- Check combine performance frequently, especially when crop or field conditions change.

- Make only one adjustment at a time and check results before making another.

- Know *why* you are making an adjustment before making it.

3. Operate at full throttle. A combine is designed to run at full engine speed. At lower engine speeds, the machine will not do a complete job of threshing and cleaning, and there will be more damage and loss.

4. Keep an even, uniform flow of material moving through the combine. A combine is designed to run at near capacity. When the combine is running nearly empty or taking in bunches of crop material, increased grain losses and grain damage are likely. Grain rubbing against grain will cause much less damage than grain rubbing against metal. The sieves particularly are designed for full capacity — grain loss out the back goes way up when the machine is near empty.

5. Select a ground speed that will not overload the combine or overrun the header's ability to do its job, but is fast enough to keep moving material in. When engine speed is reduced, the cleaning system's speed and efficiency is reduced. Reducing speeds from 7 mph to 2 mph while operating at excessive threshing speed caused kernel damage to double from 20 percent to 40 percent regardless of combine type.

6. Use the correct cylinder/rotor speed and concave clearance to properly thresh and separate the crop. Most people run the cylinder too fast and the concave too tight. You want to thresh only hard enough to get the grain off the ears, any more than that increases the amount of trash the separators will have to remove. Excessive cylinder speed is the leading cause of grain damage, so use the lowest possible setting to achieve the best total threshing. Ideally, the concave clearance at the front of the machine should be about the diameter of an ear with kernels, while the concave clearance at the back should be the size of an empty cob. Adjust concave clearance first rather than cylinder



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der speed when trying to reduce unthreshed losses.

7. Sieves must be open far enough to let all grain through. The wind through the sieves should be strong enough to remove all particles lighter than whole grain, but not so high as to blow whole grain out. A good way to adjust sieves initially is to start with them closed, throw a handful of grain on, and then slowly open them until all the grain will fit through. Adjustable sieves with wider spacing will stay cleaner than smaller ones, because they don't have to be opened as far to let the crop through. As a sieve is closed, reducing the size of the spaces, the wind speed through it is increased.

8. Corn varieties vary in how well they combine. Keep track of any of your varieties that seem especially difficult to combine successfully. This can be due to environmental effects, maturity and plant health, but some varieties are just more difficult to separate. Planting varieties that can make larger ears at lower populations are often easier to combine successfully with less field loss.

9. It is very difficult to do a good job of combining under wet conditions near 32

F, when water tends to freeze and thaw, causing grain and chaff to stick to sieves and shaker pans.

10. Doing a good job of cultivation on headlands will leave ridges that bounce combines, increasing field loss and causing combine damage. If possible, you might plan to combine the headlands and disk them flat before harvesting the rest of the field.

FIELD LOSS: LOOK BEHIND THE COMBINE

- Is it header loss or separator loss? Look under the combine and determine how many kernels and cobs are being lost at the corn head, and how many are going out the back. Often header loss can be as simple to correct as adjusting chains and dividers, straightening bent tin, repairing holes, and adjusting stripper-plate, gathering-chain and snapping-roll clearances.

- If you can find two kernels per square foot on the ground behind the combine, you are losing about one bushel of yield per acre. That is about average, but if you are losing more than that, you should check whether the snapping plates are set too narrow, try lowering the head, slow the stalk-roll speed, check tightness of gathering chains, and check whether trash is wrapping around stalk rolls.

- Are you finding whole ears on the ground? Check whether the gathering points are set too high, adjust ground speed differently, adjust gathering chairs and stalk rolls, check whether the snapping plates are set too wide, check whether you are picking rows as they were planted, and consider installing ear savers and center-shield extensions.

- In the "old days," some kernel and ear loss didn't matter, because the grazing hogs would eat them up during the winter. But for us who are likely to be planting soybeans on the field the following year, volunteer corn can be a real quality problem, so field loss becomes a double whammy.

GMO Alert! Cleaning a combine takes on a whole new meaning when harvesting high-value crops that must be segregated. Are you hiring a custom combine? Are you sure that the combine is clean enough to prevent your organic corn

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being contaminated by the neighbor's Bt corn that the combine last harvested?

Recent studies at Iowa State University show how difficult it is to really clean out a combine. After harvesting red corn and emptying the hopper, they spent hours removing remnants from every corner of the machine, gleaning an additional three bushels of corn. Then they headed into a yellow corn field. After 10 acres, they found the equivalent of another three bushels of red corn in the harvested yellow corn.

Case IH engineers say that time and high velocity air are the keys to cleaning harvesting equipment. An air compressor with lots of hose and a long-reach nozzle are the best tools for cleaning. In the field, a portable leaf blower is better than nothing. Using pressurized water just makes mud, allowing seeds to hide in unseen nooks and crannies. Purging with straw or organic grain should be done only after the machine is manually cleaned, as purging alone is not an effective method of cleaning. The Case IH engineers estimate that a thorough cleaning of a combine can take up to four hours. They have developed a checkpoint system, identifying key areas of a combine where stubborn contamination is likely. These areas include specific sites on the cutting platforms, corn head, feederhouses, separators, grain tanks and unloading augers.

DAMAGE

Field and storage losses look much different when harvesting \$5-\$6/bu organic corn as compared to \$2/bu conventional corn. Purdue University researchers estimate that in the United States, stored-grain losses exceed \$500 million each year for conventional corn.

Iowa State engineers found that poorly adjusted combines can do far more damage than generally thought. At common combine settings, an average of 30 percent of the corn kernels can be damaged. Much of this damage is not apparent in the field — hairline fractures and cracks can be invisible in wet grain, but will lead to grain breakage during drying and result in increased shrink and insect and mold damage during storage. The per-

MAXIMUM RECOMMENDED MOISTURE CONTENTS FOR AERATED GRAIN

| <i>Storage Period</i> | <i>Moisture Content</i> |
|----------------------------------|-------------------------|
| Sold or fed as #2 grade by April | 15.5% |
| Marketed by June | 15% |
| Up to one year | 14% |
| Over one year | 13% |

centage of damage rose dramatically when the combine was speeded up. Increasing the rotor speed from 300 to 600 rpm resulted in a change from 5 percent to 30 percent damage. Similar amounts of damage occurred when the cylinder speed was increased.

Not all buyers will dock for damaged grain if it is sold at harvest, but for the farmer, losses due to damaged grain can be significant. Grain with 15 percent damage can be safely stored for 50 percent longer than grain with 30 percent damage. The damaged grain more rapidly loses moisture, and therefore weight, in storage and is much more likely to break during drying, handling and storage. Damaged grain is more likely to be attacked by insects and mold, further reducing quality and increasing storage loss and shrink.

Animal-feed standard. Most corn sold for animal feed is expected to meet US#2 grade standards, which are: test weight, minimum of 54 pounds/bushel; moisture, maximum of 15.5 percent; damaged kernels, maximum of 5 percent; and broken corn plus foreign material, maximum of 3 percent. The percentages for damage are based on weight, not volume, so when assessing a sample, it is important to separate out damaged or broken kernels and foreign material and *weigh them*.

Drought: special concerns. Many farmers around the country have grown crops in 2002 under serious drought conditions. Yields are down, but the damage can go far beyond that. Corn grown under

drought conditions tends to be lower in test weight and lower in starch, the cobs tend to be softer and harder to shell, and the grain is more subject to damage in harvest and handling. Stalks may be tougher and more difficult to thresh, and fields may be more uneven in maturity

and yield. We need to be aware of this potential, handle our corn more gently, and set our combines accordingly, because the adjustments become much more important.

What if it freezes too early?

Both late planting and early season frosts can result not only in reduced yields but also in low test weights and more potential for kernel damage. Early frosts can also increase the potential for ear molds that can lead to mycotoxin problems. To prevent problems with mycotoxins, harvest as early as possible and set the combine for high levels of wind to blow out damaged and lighter kernels and cob pieces. Drying quickly after harvest at relatively high temperatures will stop further mold growth, but will not reduce mycotoxins that are already present.


Taking calculated risks. Does damaged corn mean that you must clean out all broken kernels and discard them? Not necessarily, but it really depends on your market and on how long you store the crop. The animal-feed market is fairly forgiving of damaged grain, as long as there is minimal mold and insect infestation. However, be aware that while this resulting damage may be suppressed during the winter when temperatures are below freezing, much more damage will occur in the spring once the weather warms up. If you know you have significantly damaged corn, try to sell it before spring.

SAFE STORAGE

How do you prevent stored grain from losing quality? Here are a few useful pointers:

- Make sure the storage bins are clean, repaired, and prepared before filling. This issue was covered thoroughly in the previous installment, but remember — clean your harvesting and handling equipment before use, clean and repair bins thoroughly before filling, do not put new grain on top of old grain, and do not mix good grain with bad grain if you can help it.

- Dry the grain before storage, then cool to ambient air temperature before putting it into the bin. Clean grain before storage if necessary to remove excess foreign material. Foreign material will accumulate at the center or edges of the bin, creating potential pockets of mold and insect infestation.

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- Take a load out within a month of filling the bin to equalize moisture and break up any crusting.

- Check grain regularly for deterioration. Check more frequently the following spring and summer as grain warms up.

- Aeration in the bin is a good way to maintain a seasonally cool temperature and uniform grain temperature. During the fall, aeration is important to remove dryer heat and equalize moisture levels throughout the grain. During the winter, operate the fans only when the air temperature is the same as or colder than the grain. Operating fans on warm winter days can cause moisture to condense on cold grain. If grain is stored into the following summer, run fans only at night, when the temperature is fairly cool. Remember that proper aeration also requires proper ventilation, so make sure there are no obstructions for air movement through the grain.

- If grain is frozen during the winter, it may be necessary to warm it up evenly with aeration when spring comes to prevent condensation on the edges and top. Operating the fan continuously when thawing frozen grain will prevent refreezing, condensed moisture and damp spots on the grain.

DO THE PAPERWORK

Make a careful record of all your harvest, handling, equipment cleanout and storage. This is a critical part of your required audit trail. Whenever you ship any product off your farm, it should be accompanied by:

1. A bill of lading, listing your name and address, your buyer's name and address, the date, the product identified as certified organic with your certification, a lot number, and an estimated or actual weight.

2. A clean truck affidavit or truck cleaning document. This can be as simple as a statement written on the bill of lading, but the point is to document that you, as the organic producer, have taken responsibility for the sufficient cleanliness of all equipment and transport vehicles.

3. Weigh slip.

4. A copy of your organic certificate under which the product is certified.

5. A Certificate of Compliance (FVO), Transaction Certificate (OCIA), or Organic Transfer Monitor (NOFA) sent to your buyer as soon as possible to document the transfer of the organic product.

Remember: Keep copies of everything for your records!

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