

# Harvesting High Quality Organic Grain

## *Small Grains*

*First in a Three-Part Series*

by Mary-Howell & Klaas Martens

Standing out in your field, surrounded by those amber waves of grain, it is hard to imagine that the value of this beautiful crop could be spoiled by mishandling during harvest, transport, and storage. Growing the crop is only half the battle, but it is the part that farmers tend to focus most on. Our conventional farming experiences have thoroughly and mistakenly taught us that quantity, not quality, is all that really matters.

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 and delivering moldy corn, buggy wheat, stained soybeans or checked red kidney beans. We must make sure that the organic products we deliver are of the highest quality.

### **HARVESTING FOR QUALITY**

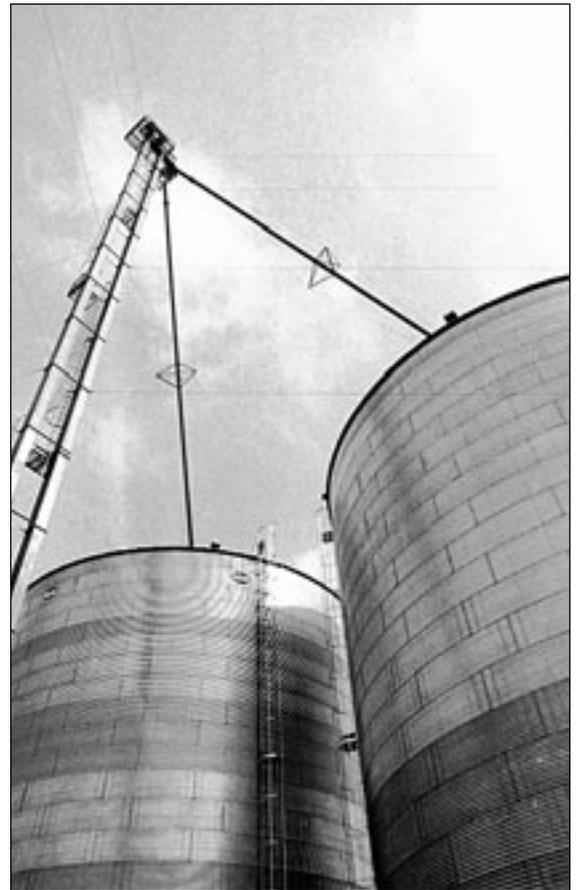
**Cleanout.** We organic farmers can't resort to chemical means to control

insects, rodents or mold. We can't go in and spray if things get away from us, either in the field or in storage. We must *plan* from the very start to prevent these problems before they even begin.

Combines, augers, trucks and other handling equipment should be cleaned prior to harvest to remove any old grain that could be a source of mold and insects. Experts recommend destroying or feeding to animals the first few bushels of grain augured through each piece of equipment as harvest begins to scour out any old material clinging inside.

Remember that organic farmers have even more reasons to cleanout. If you are not using dedicated organic harvesting and handling equipment, your certifier will expect you to maintain a cleanout log, showing that the equipment was thoroughly cleaned and purged of conventional grain before any organic grain was introduced. This is particularly critical with custom hired equipment which is likely to also be used to harvest Bt corn and Roundup Ready soybeans. You do *not* want those contaminating your organic grain!

Cleanout the bins, too. It may not be pleasant— getting in the bin to shovel, sweep, vacuum, and perhaps even scrape and hose down. Its hot, dusty, dull work that feels very unproductive and is uncomfortable. But you should never



put new, clean, insect-free grain into a bin on top of old grain. It is just too easy to overlook an already existing insect or mold problem. If the old grain was infested, the problem will spread upward into the new grain, and extensive damage may occur before it is apparent at the surface. Don't just dump the cleanout on the ground outside the bin — all the old grain should be removed from the area so populations of insects do not migrate back into the newly filled bin. This is particularly important in summer-harvested small grains, because it is a long time before cold winter temperatures will slow down mold and insect growth.

**Repair.** While cleaning, check that the bins are tight, with no cracks or leaks. Check sides and roof for leaks, corrosion and broken bolts, and repair and replace damaged areas, especially if they will allow moisture, insects and/or rodents to enter the bins. Make sure the fans and aerators work before filling the bin. Some farmers suggest putting a light inside the empty bin at night to better see leaky areas. Caulk and repair damaged areas.

Cleanout around the bins, too. Remove high grass, weeds, spilled grain and debris

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from around grain bins, which will attract insects and rodents. Finally, *now*.

**Begin Harvest as soon as the grain is ready.** The highest test weights and best grain quality are seen after the first dry-down of the crop. If wheat stands in the field after this time and is rewetted by the rain or heavy dew, the grain shrivels more, test weight is reduced, sprouting can occur, and field loss is increased.

**Onion Alert!** It is a distinctive smell, that faint oniony aroma rising as you unload the truck, slightly reminiscent of pizza. To be sure, garlic bread is great, but most processors of human food do not want to buy grain contaminated with wild garlic or onion. It is possible to clean much of the onion/garlic bulbs out of the wheat by using a seed cleaner with appropriate-sized screens. It is also possible to use the garlicky grain as feed grain, because animals are not so fussy. But it is better to avoid planting food-grade small grains on land where you know there is a wild onion/garlic problem until you have eliminated it. Field applications of gypsum will help to eliminate wild onion/garlic over several years.

**Vetch Alert!** One of our New York Certified Organic members was told several weeks ago that if his spelt buyer found as much as one vetch seed in a truckload of spelt, this was potential grounds for rejection of the entire truck. Why? Vetch is difficult to remove from spelt or wheat, as it is just about the same size, shape and weight, and ground vetch can make flour bitter and unpleasant.

How do you avoid vetch problems? Don't grow wheat or spelt destined for the human food market in fields where you know you have a vetch weed problem. Insist on buying seed that is not contaminated with vetch seeds. If you do get vetch in your grain, be prepared for your buyer to clean the grain very stringently, which may result in less good grain that you will be paid for. Jack Kenny of Agriculver, who buys much of the organic spelt produced in New York, wishes that more growers would go out and hand-rogue weeds in the spring, when rye pokes its ugly head above the spelt canopy, and before vetch has gone to seed. The other problem with vetch is that it often has "hard seed," which can lie dormant in a

## MAX GRAIN MOISTURE FOR AERATED GRAIN STORAGE

Grain Type	<6 months	6-12 months	>12 months
Shelled Corn	15%	14%	13%
Soybeans	14%	12%	11%
Wheat	14%	13%	12%

field for several years before germinating, causing weed problems for years to come.

**Mycotoxin Alert!** Mycotoxins are produced by certain types of fungi that grow on maturing grains. Wet, rainy, warm and humid weather from flowering time onward promotes infection of corn and cereals by mycotoxin-causing fungi. Infection with mycotoxins is most common on kernels damaged by insects, birds, mites, hail, early frost, heat and drought stress, windstorms, and other unfavorable weather.

Several species of the common soil fungus, *Fusarium*, can result in ear rot in corn and scab or head blight in wheat, barley, oats, and rye and can produce vomitoxin, fumonisin, and zearalenone. Several species of *Aspergillus*, also a common soil fungus, can commonly cause stored grains to heat and decay and produce aflatoxins. Aflatoxins can be tested for with black light, but often the presence of *Fusarium* toxins is not noticed until after there is an adverse reaction from feeding contaminated grain to animals. Mycotoxins make the grain unpalatable, can cause reproductive problems in animals due to estrogenic activity, and can even be toxic.

There are several important steps that can be taken to minimize mycotoxin production:

1. Always use cleaned, high-quality seed that is not carrying seed-borne diseases. Even if the seed-borne diseases themselves do not produce mycotoxins, they can weaken the plant and damage the grain, which then can lead to infection with mycotoxin-causing fungi.

2. Harvest at maturity and as soon as the moisture content allows minimum grain damage. For shelled corn this would be 23 to 25 percent moisture; ear corn, 25 to 30 percent; small grains, 12 to 17 percent; soybeans, 11 to 15 percent.

3. Adjust the harvesting equipment for minimum seed or kernel damage and

maximum cleaning. Especially where scab is evident in the field, the combine should be set for maximum cleaning and with higher blower speeds, to remove the small, shriveled and diseased kernels. Grain damaged during harvest or contaminated with foreign material is much more likely to develop mold and insect problems in storage.

4. Dry all grain to at least 14 percent moisture as rapidly as possible, at least within 24 to 48 hours after harvest. Safe, long-term storage can be achieved at a moisture level of 13 percent or somewhat below.

5. Cool the grain after drying and maintain dry storage conditions. It may help to clean the dried grain to further remove diseased kernels and fines, but do not feed the screenings to animals.

6. Thoroughly clean the grain and all bins before storage to remove dirt, dust and other foreign matter, crop debris, chaff, and cracked or broken seeds and kernels. Remember, mold-infected kernels are fragile and easily broken. Broken or damaged kernels are more likely to be mycotoxin contaminated.

7. Store in water-, insect-, and rodent-proof structures. Continue periodic aeration and probing for "hot spots" at intervals of one to four weeks throughout the storage period.

### BEFORE YOU STORE

**Inspect the grain critically.** If there are weed seeds, weed debris, chaff or non-grain material, clean the grain before putting it into the bins. Foreign matter will cause the grain to deteriorate faster, and your buyers won't be happy with your product. Try not to inflict your disasters on your buyers! You may get away with it this year and not get docked for quality problems, but buyers remember who delivers quality, especially if your bad grain causes them significant product loss.

**Does the grain need to be dried?** Check your contracts or with your buyer. Jack Kenny says that their spelt contracts

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specify that the grain must be 12 percent moisture or lower — and they mean it. During the summer, this may mean using heat and a grain dryer, because just putting aerators into grain bins may not remove enough moisture if the ambient air humidity and temperature is high.

### Should you use diatomaceous earth?

DE is an organic farmer's best defense against storage insects. Jack Kenny recommends adding one to two pounds DE per ton of grain as it goes into the bin — first dribbling it into the auger, and then dusting DE fairly liberally on the surface of the grain once the bin is filled. Make sure you wear a dust mask when handling DE — it can be extremely irritating and even hazardous. Write down where, when and how much you used — DE is considered an input in your certification paperwork.

### STORING SMALL GRAINS

**Only clean, dry grain should be put into storage.** Studies have shown that the moisture level of the grain going into storage is key to successful storage. For poor quality grain, such as grain produced under drought or moisture stress, or with a large amount of broken or damaged kernels, the recommended maximum moisture levels should be 1 percent lower. Note that this percentage refers to the *highest* moisture in the bin, not the average moisture. As little as 0.5 percent moisture can mean the difference between safe storage and a damaging invasion by storage fungi.

**Check your bins.** Bins should hold the grain without leaks of rain or snow from outside, without access for rodents and

birds, without contact with soil, and with sufficient headroom to permit sampling, regular inspection and ventilation.

**Be sure that headspace air is sufficiently ventilated.** If you pack a bin to the roof, water condensation where the grain touches the roof will likely result in mold which can spread downward through the grain. Warm, moist headspace air can activate mold growth, causing grain to crust and seal over, especially when grain is peaked. Mold can spread over kernel surfaces, resulting in caking near the surface in about three weeks. It will also produce CO<sub>2</sub> along with water and heat, raising the humidity and causing further mold growth. Crusting and caking is not just a grain-quality problem, the chunks can get stuck in augers, making unloading the bin really difficult.

**Check it regularly.** The chance of grain becoming insect infested or moldy increases when it is left undisturbed for several months. A regular, monthly inspection routine throughout the grain storage time is important, especially during the summer and early fall months, when grain temperatures are optimal for rapid insect and mold development. During warm weather, insect infestations generally begin near the grain surface, usually at 6 to 12 inches depth, and especially at the point of entry where dust, broken kernels and chaff accumulated during filling. Walk out onto the grain — your feet should sink in slightly. If the grain feels hard, this could indicate caking. Smell the grain for mold, look for insects, stick your hand down into it at least 10 inches to check for heating and caking.

**Take a load out.** It helps to draw out a load about a month after filling the bin. This breaks up and pulls out any moldy grain that might have formed at the surface.

### HOW MUCH DO YOU HAVE??

• The volume of grain in a bin can be calculated by using the following formula: (3.14 times diameter of bin<sup>2</sup> ÷ 4) times height of grain in bin = cubic feet of grain.

• Now, multiply the cubic feet of grain by 0.8 to give you the number of bushels.

• Weight of grain in pounds = (bushels times your grain's test weight) ÷ standard test weight. (Standard Test Weights: wheat, at 13.5 percent moisture, generally weighs 60 lb./bu.; barley, at 13.5 percent moisture, weighs 48 lb./bu.; corn, at 15.5

percent, weighs 56 lb./bu.; soybeans, at 13 percent, weigh 60 lb./bu.; oats, at 13 percent, weigh 32 lb./bu.)

“Test weight” refers to the weight of a bushel of a sample of grain, which can be compared to standard weight for that grain type. Test weight is calculated by weighing a quart of grain and multiplying it by a conversion factor to give a projected weight per bushel of that grain. Low test weight is usually associated with lower quality grain — excess foreign material, insect damage, or grain that was grown under stress, especially drought. A good cleaning with the right size screens will often raise test weight appreciably.

### DO THE PAPERWORK

You're an organic farmer, so you're not done until the paperwork is done. Make a careful record of all your harvest, handling 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!*

*Mary-Howell & Klaas Martens raise mixed grains on more than 900 acres in the Finger Lakes region of western New York, with every acre certified organic. Mary-Howell is a former genetics researcher and a frequent writer for Acres U.S.A. They can be contacted by email at <kandmhfarm@sprintmail.com>.*