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Drying, Handling, and Storing Wet, Immature, and Frost-Damaged Corn

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Unusually cool growing season weather and early frosts can lead to wet, immature, and frost-damaged corn. This publication describes some of the harvest conditions you can expect after a cold, short growing season and some possible steps to deal with the crops that result from such a growing season.

What to Expect After a Cold, Short Growing Season

Here are some of the things that might be expected at corn harvest after a cold, short growing season compared to a more normal growing season:

- Higher harvest moisture, which could contribute to slow and expensive drying. With slow drying, you might have to park the combine occasionally to give the dryer a chance to catch up. Drying costs will be especially high in years when gas prices are high.
- Uneven harvest moisture. Some fields or some parts of fields are likely to be wetter than others.
- Smaller corn kernels.
- Lower test weight.
- More chaff, fine material, and broken kernels.
- Poorer storability. The combination of more chaff, fines, and broken and cracked kernels could lead to greater risk of mold growth in storage.

How to Prepare for Harvest

Corn drying systems are likely to be used a lot of hours after a cold, short growing season, so it would be wise to clean, lubricate, and check drying and conveying equipment thoroughly before harvest to make sure that everything is in working order. If possible, it might also make sense to change a few operating procedures to reduce bottlenecks, energy use, and quality loss during drying (see the section on reducing drying costs, and go to www.bae.umn.edu/extens/postharvest and take a look at MWPS-13, "Grain Drying, Handling, and Storage" for more information). For dryers that use LP gas (liquefied petroleum gas; commonly called propane, which is the primary component of LP), it would be helpful to estimate how much fuel will be needed for drying and to make sure that you have ordered enough gas to get you through harvest.

Expected Gas Use for Gas-Fired Dryers

Gas use by gas-fired corn dryers varies widely with type of dryer, how the dryer is managed, corn moisture level (it takes a little less energy to remove moisture from wet crops than it does from dryer crops), and weather at the time of drying. The best source of information on gas use is your own records for gas use, bushels dried, and moisture removed. But if you lack better information, a very rough estimate of gas use for gas-fired drying is **0.02 gallons of LP per bushel per percentage point of moisture removed**. (For dryers that use natural gas,

the equivalent number would be about 1840 cubic feet of gas per bushel per percentage point of moisture removed.)

When five percentage points of moisture are removed (for example from 20% moisture down to 15% moisture, wet basis), you could expect to use 0.1 gallons of LP per bushel (5 points x 0.02 gal per bu per point). When LP gas costs $0.50 per gal, the gas cost would have been about $0.05 per bushel. But if you need to remove ten percentage points of moisture and gas costs $1.00 per gallon, then the cost of gas for drying could be $0.20 per bushel (10 points x 0.02 gal per bu per point x $1.00 per gal).

Remember that cost of gas is only part of the cost of drying. You also need to consider the cost of electricity to run fans (relatively small on a per bushel basis for gas-fired dryers), labor to manage the drying system, and depreciation, taxes, insurance, repairs, and maintenance on the drying equipment.

Possible Ways to Reduce Energy Costs for Drying

Here are some approaches that you might consider to reduce drying time and cost. (Go to www.bae.umn.edu/extens/postharvest and request "Saving Energy in Corn Drying" for more information.)

- Livestock feeders could consider making more silage and high moisture corn. Plastic silage bags might be an option for people who don't have enough silo capacity. Remember that shelled corn needs to be harvested at 25 to 30% moisture to get good fermentation in high moisture corn storage.
- Let corn dry as much as possible in the field. Immature and frost-damaged corn will dry down eventually. If the risk of losses from ear drop and lodging isn't too high, it might be worth delaying harvest.
- Livestock feeders, or farmers who can sell corn to livestock feeders, could consider harvesting late, aerating corn to cool it to 20 to 30°F, and holding wet corn in this temperature range until it can be fed or sold. If you use this option, the corn must be out of the bin by spring or you need to have a plan for spring drying.
- If you aren't already using some kind of slow cooling method after gas-fired drying, consider modifying your system to allow for slow cooling. Slow cooling results in extra moisture loss during cooling (which saves energy and drying time) and it results in better corn quality. (Go to www.bae.umn.edu/extens/postharvest and click on "Dryeration and In-Storage Cooling for Corn Drying" for more information.)
- Consider using natural-air drying for part or all of your corn. Natural-air drying is an in-storage drying method that uses large fans to force unheated outdoor air through corn over a period of several weeks to several months. Natural-air drying uses electricity to operate the fans, but no gas. Because gas costs have risen relative to electricity costs, it might be worth comparing the costs for natural-air drying to the costs for gas-fired drying. For natural-air drying to be successful, it's very important that you match corn moisture to airflow supplied by the drying fan and that you fully understand the drying process. (Go to www.bae.umn.edu/extens/postharvest and click on "Natural-Air Corn Drying in the Upper Midwest" for more information.)

Steps to Preserve Grain Quality

Immature and frost-damaged corn will have marginal quality to start with, so it's important to

manage equipment carefully to minimize further quality degradation.

- Set combines carefully. You'll have to balance the need for aggressive shelling action to get small kernels off the cob against the extra kernel damage that is caused by aggressive shelling. Also, you'll have to balance the need for aggressive cleaning to remove chaff and small particles against the yield losses that occur when small, light kernels are blown out of the combine.
- Manage fines and chaff. Fine particles and chaff affect airflow movement and increase mold problems in storage, so consider cleaning grain to remove fines and chaff, "core" bins to pull fines out of the center, or make sure that fines and chaff are uniformly distributed throughout the storage bin rather than being concentrated in certain areas (under the fill spout, for example).
- Dry grain to uniform moisture levels that are safe for storage. Because harvest moisture is likely to be somewhat uneven after a cold, short growing season, it will be important to check the moisture content of every load of corn and to reset dryer controls based on changing moisture levels. Make sure that the moisture content of dried corn is low enough for safe storage (15% for winter storage, 14% for storage into spring and summer, 13% for storage a year or more storage time) and consider reducing these moisture levels by about a percentage point for corn that is of especially low quality (immature, frost-damaged, low test weight).
- Dry corn as gently as possible. It will be tempting to use high drying temperatures to boost dryer capacity, but keep in mind that high drying temperatures result in lower test weight and in more cracked and broken kernels. Natural-air drying (no heat) gives better test weight and less kernel damage than gas-fired drying.
- Use slow cooling methods after gas-fired drying to minimize quality problems.
- Aerate stored grain to cool it to 20 to 30°F for winter storage (in the upper Midwest). If you hold corn in the 20 to 30°F range during winter, you might not need to warm the grain in spring, but if you do aerate in spring, make sure that you don't warm the grain above about 50°F. (Go to www.bae.umn.edu/extens/postharvest and click on "Management of Stored Grain with Aeration" for more information.)
- Check stored grain frequently so that you can quickly address minor spoilage problems before they become big, costly problems.

Marketing Low Quality Grain

It's true that low quality grain doesn't store as well as high quality grain, but if you can manage stored grain well enough to prevent further quality degradation, you might be able to get a better price by delaying sale until after harvest. Discounts for low grain quality tend to be higher when buyers are flooded with low quality grain. If you can delay sale until buyers have more grain on hand that can be used for blending, or if you can shop around to find buyers whose discounts aren't as high, you might be able to get a better price for your grain. Different grain buyers are looking for different quality factors and local livestock feeders might be interested in grain that other buyers might discount – or vice versa.

Be Careful!

Grain harvesting and handling are potentially dangerous operations even under the best of conditions. Handling wet and immature crops can add even more safety concerns. (See

http://safety.coafes.umn.edu/ for more information.)
Here are some things to watch for:

- Combine fires due to difficult harvest conditions and excessive chaff build up. Clean combines frequently and make sure you have at least one 10-pound ABC dry chemical fire extinguisher available.
- Dryer fires due to longer drying times and fines and chaff build up in dryers. Clean dryers as needed to remove fines and chaff. Keep an eye on dryer temperatures and controls.
- Injuries caused by fatigue due to long, slow harvest and drying operations. Pace yourself; take a break every couple of hours.
- Health problems caused by breathing fine dust particles and spores from moldy grain. Manage grain to prevent mold growth. If you must work around moldy grain, and your health permits you to wear a respirator, use a respirator that can filter mold spores. If you have health conditions affecting your heart or lungs, or if a doctor advises against wearing a respirator, find another way to get the job done or hire someone who can wear the right protective mask.

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