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**Long-term Grain Storage Requires Good Management**

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The amount of grain in storage continues to increase.

Corn stocks on Sept. 1 were up 161 percent from 2016. Of that, 54 million bushels are stored on North Dakota farms, which is a 315 percent increase. Soybean stocks are up 212 percent, with 9.8 million bushels stored on farms.

Across the U.S., corn stocks are up 32 percent from September 2016 to 2.29 billion bushels, with 787 million bushels stored on farms. Soybean stocks are up 53 percent to 301 million bushels, with 87.9 million bushels stored on farms.

Maintaining grain quality during extended storage will require extra care and management, according to North Dakota State University’s grain storage expert.

“Grain that will be stored for an extended time needs to be good-quality grain,” NDSU Extension Service agricultural engineer Ken Hellevang says. “The outer layer of a grain kernel is the pericarp, or seed coat, and provides protection for the kernel. If the pericarp is damaged, the kernel is more susceptible to mold growth and insect infestations. This reduces the expected storage life of the grain.”

**Clean Grain and Storage Bins**

Clean the grain to remove broken kernels and foreign material before storing it. Segregation based on size and density occurs as grain flows into storage. Fines accumulate in the middle unless a functioning distributor spreads them throughout the grain. Unloading some grain from the center of the bin will remove some of the fines and help level the grain in the bin.

In addition, immature kernels have a much shorter expected storage life. Grain test weight may be an indicator of maturity and storability.

Assure that the storage facility is clean and insects are not living in aeration ducts, under perforated floors, or in handling equipment or debris around the facility. Fumigate empty bins to kill insects under the floor or in aeration ducts if an infestation occurred during the previous year. Also, consider applying an approved residual bin spray and a grain protectant to repel potential insect infestations if storing grain during warmer portions of the year.

**Reduce Mold Growth**

Mold growth requires moist conditions, usually above about 70 percent relative humidity, and warm temperatures. To reduce the potential for mold growth, the grain moisture content should be below the equilibrium moisture content (EMC), at 60 to 65 percent relative humidity.

The EMC of corn is about 13.5 percent at 70 degrees and 65 percent relative humidity, and about 15 percent at 50 degrees. If you can keep stored corn below 50 degrees, you can store it at 15 percent moisture. However, if the temperature will be warmer than 50 degrees, then the recommended storage moisture content is about 13.5 percent. EMC charts for various types of grain are available on the internet.

**Long-term Grain Storage**

Cool grain rapidly after harvest if it’s going into long-term storage. Also, cool grain that has been stored during the summer.

The allowable storage time (AST) is an estimate of the life of the grain until it has deteriorated enough to affect grain quality. Grain AST charts, such as those in the publications section of the NDSU grain drying and storage website (<https://www.ag.ndsu.edu/graindrying>), are available online.

The allowable storage time is dependent on the grain condition, moisture content, and temperature. Determining the amount of storage life remaining will assist with managing the stored grain.

The AST is cumulative, so if one-half of the storage life is used before the grain has been dried and cooled, only about half of the life is available for the drier grain. For example, corn stored at 20 percent moisture and 50 degrees has an AST of about 50 days. If it is dried to 15 percent after 25 days and cooled for winter storage but warms to 70 degrees next summer, the AST at 15 percent moisture and 70 degrees is only about 60 days, rather than the 125 days shown in an allowable storage time chart.

“Controlling grain temperature is critical for maintaining grain quality,” Hellevang says. “Insect reproduction is reduced below about 70 degrees, insects are dormant below about 50 degrees, and insects are killed if grain is below 30 degrees for a few weeks.”

Moisture migration increases the moisture content at the top of the bin when about a 20-degree temperature difference occurs between the grain and average outdoor temperature. Therefore, the grain should be cooled with aeration when you have a 10- to 15-degree difference between grain and average outdoor temperatures. Cool the grain to 20 to 30 degrees in northern states and 40 degrees or cooler in southern states for winter storage.

The bin vents could ice over when the aeration system is operated near or below 32 degrees. Utilize a sensor to stop the aeration fan if bin roof pressures become excessive, or leave access doors open to serve as pressure relief valves if operating the aeration system near freezing temperatures to reduce the potential for damaging the roof.

Hellevang also has this advice for long-term grain storage:

* Do not place new grain in bins with last year’s grain. Any insect infestations or spoilage that starts in last year’s grain will affect the new grain.
* Check the grain at least every two weeks until it has been cooled for winter storage and every two to four weeks during the winter.
* Verify that the moisture content is at the recommended storage level.
* Check the grain temperature.
* Inspect for insects.
* Look for indications of storage problems, such as condensation on the roof.

“Using temperature cables or sensors to monitor grain temperature is encouraged, but remember that because grain is a good insulator, the temperature can be different just a few feet from the sensor,” Hellevang says.

For more information, search for long-term grain storage at university websites on the internet.