Long-term Grain Storage Requires Good Management

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.

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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.

Continued on next page