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Grain Drying Guidelines for a Wet Fall Harvest

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A high-moisture-content harvest can result when crops mature late, an early freeze occurs, or fall weather conditions are wet. Higher moisture contents at harvest generally mean more fines and broken corn, more difficult conveying, slower drying, and higher fuel consumption. Field drying diminishes significantly as the weather cools and essentially stops by mid to late November. When deciding whether to delay harvest to save fuel, consider that an increase of about 2% in field losses is equal to the cost of the extra fuel needed to dry wet corn from 25% to 20% moisture.

Inspect fall, frost-damaged corn the morning after the frost as soon as the plant has begun to thaw out. Options for handling fall, frost-damaged corn depend on the plant stage when frost occurred, i.e., milk, dough, or dent.

If the corn was frozen in the milk stage, grain yield will be low and green-chopping or ensiling may be the only option. If the corn was frozen in the dough stage, yields may be reduced by at least 50% and the test weight may be less than 50 lb/bu. Since kernel moisture will still be above 60%, the crop must be left to field dry. During this period, field losses will increase due to stalk breakage and ear molds.

Corn that is frost-damaged during the early- to mid-dent stage will yield 22 to 40% less, and test weight will be reduced. There may be a 4 to 12% yield loss in corn that was in the late-dent stage before the frost, but test weight will be close to normal.

Drying Strategies and Guidelines

High-temperature, in-bin, batch and continuous flow dryers are best for rapidly drying high-moisture crops from above 2–22% to safe storage levels. The problems involve increased time and fuel requirements and reduced or slower flow problems that may come from excessive fines. There is more possibility of heat damage when drying excessively high-moisture grain. Heat damage (recognized by kernels turning brown or mahogany color) is more likely to occur when immature corn is involved. It may be necessary to reduce drying temperatures to avoid heat damage. Increased fines in batch-in-bin drying depths of 2 1/2’-4', or in stirred depths of 4'-8' or more, may be a problem. The solution is to clean the grain and/or reduce the grain depth. If you have sufficient heat output, use a shallower grain depth than usual to get more drying capacity in a bin dryer. The reduced grain depth increases both air flow per bushel and total air flow.

Low and natural air drying systems are not recommended for moisture contents above 20-22%, unless the bins are layer-filled or have additional airflow capacity. Natural-air and low-temperature drying systems will be difficult to use successfully with the high moisture contents of fall, frost damaged grain. Combination drying is an option. Grain is pre-dried to 20-22% moisture in a high-temperature dryer, then drying is completed with the natural-air or low temperature system. Additional grain drying strategies are shown in Figure 1.

High-moisture soybeans may contain many immature green beans when harvested. Natural-air or low-temperature drying at a minimum of .5 cfm/bu can help to limit the amount of bean damage from drying. For the long exposure times in these systems, limit the heat added to above ambient-plus-20 F and maintain the relative humidity above 40%. High-temperature systems may leave higher amounts of green beans, which translates into higher dockage at the elevator.

High, initial moisture content or drying to excessively low moisture content requires lower drying air temperatures to maintain grain quality. Poor initial grain quality can also require lower drying air temperatures. Generally, to maximize drying rate and fuel efficiency, dry at as high temperature as you can and still be satisfied with the final grain quality. If quality is not satisfactory, reduce drying air temperatures for any type of heated air dryer.

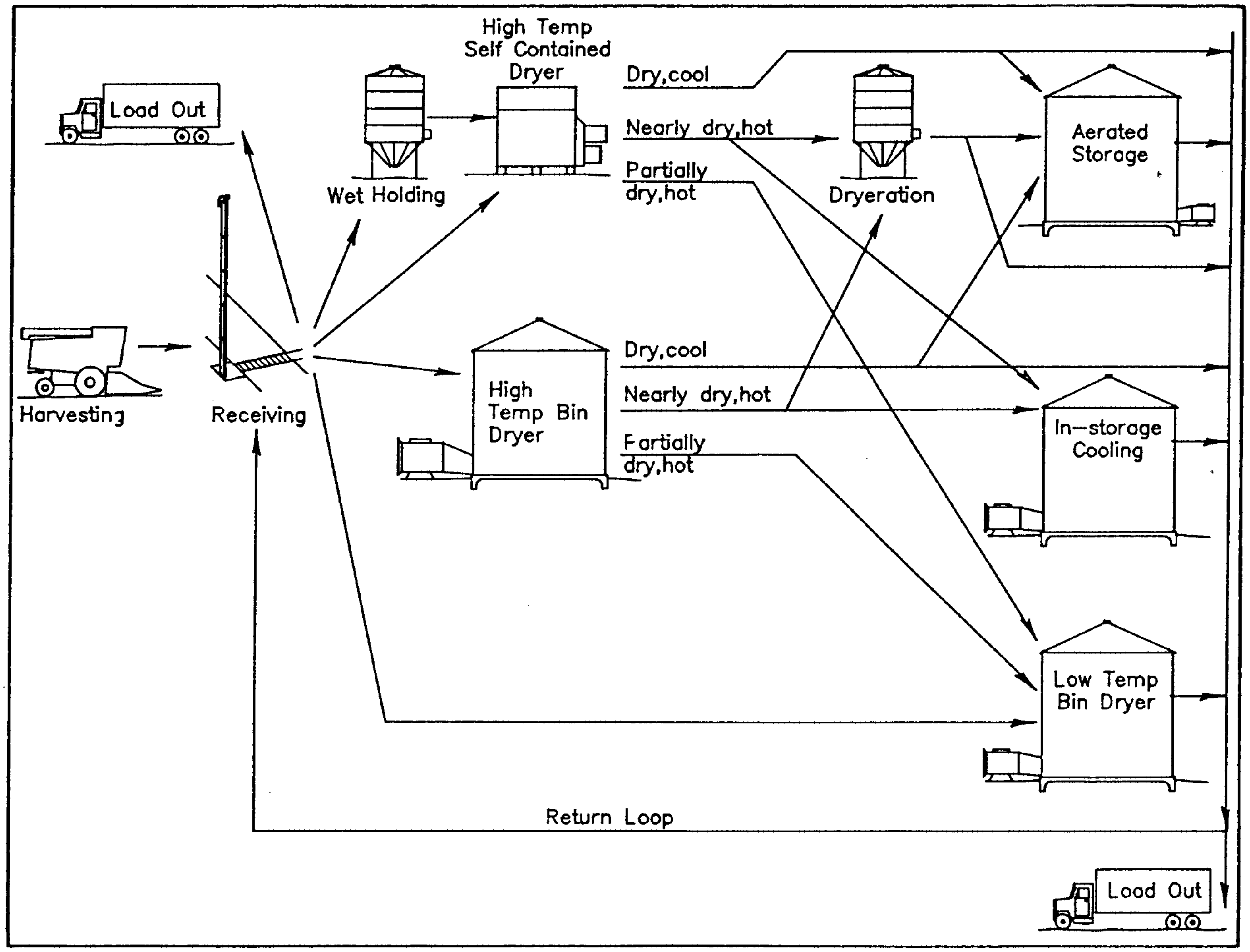
Drying Temperatures

• For seed grains, dry at temperatures below 110 F regardless of all other factors.

• Dry edible beans using drying air temperatures below 100 F to reduce splits and seed coat cracking.

• Dry market soybeans at temperatures up to 140 F in high airflow column dryers, but not over 110 F in bin dryers. At these

Figure 1. Grain Drying Options (MWPS-13)



temperatures, splits and seed coat cracking do not generally affect marketability. However, check bean quality frequently during drying, and reduce temperature if necessary.

Feed grains such as corn and milo can be dried at higher air temperatures.

• High-speed, automatic batch and continuous-flow dryers often operate at 200-220 F for corn if cooled immediately in the dryer, and up to 240-250 F with delayed cooling.

• Heated air batch bins, with or without stirring, can operate at 110-140 F on feed grains. If drying grain at depths exceeding 4' without recirculating or stirring, limit drying air temperatures to 10 F above ambient air to prevent overdrying.

Dry frost-damaged corn to kernel moisture of 11 to 12% for long-term storage. If the corn is to be fed or to be sold during the winter months, drying to 13-14% moisture should be sufficient. Over-dried corn is safer for storage, but it also has a much greater breakage susceptibility than corn delivered at 15% moisture.

Allowable storage times in days for shelled corn at varying temperatures and moisture content are given in Table 1. Maximum recommended moisture contents of clean, sound grains for storage with aeration are listed in Table 2.

Table 1. Allowable storage time in days for shelled corn.

Corn temperature	Moisture content										
	14	15	16	17	18	20	22	24	26	28	30
30° F			847	503	323	160	95	64	47	37	31
35			634	377	242	120	71	48	35	28	23
40		879	474	282	181	90	53	36	26	21	17
45		657	355	211	135	67	40	27	20	15	13
50		492	265	158	101	50	30	20	15	12	10
55	769	368	199	118	76	38	22	15	11	9	7
60	576	275	149	88	57	28	17	11	8	6	5

Calculated from research completed at USDA Grain Storage Research Laboratory, Ames, Iowa. Based on 0.5% dry matter loss from kernels with normal harvest damage; kernels with greater damage will spoil two to five times faster.

Table 2. Maximum recommended moisture contents of selected clean, sound grains for storage with aeration.

	Short-term (less than 6 months)	**Long-term** (more than 6 months)
Corn	15.5%	13%
Edible Beans	15	13
Millet	10	9
Sorghum	13.5	13
Soybeans	13	11
Non-oil Sunflower	11	10
Oil Sunflower	10	8

Grain Drying, Kenneth J. Hellevang, 1987.

For More Information

The MWPS-13 booklet, "Grain Drying, Handling and Storage Handbook," covers the whys and hows of developing a total grain system for the farm. This booklet is available for $7 from the Agricultural Engineering Department, South Dakota State University, Brookings, SD 57007 or from your county Extension agent.

This publication and others can be accessed electronically from the SDSU College of Agriculture & Biological Sciences publications page, which is at http://agbiopubs.sdstate.edu/articles/ExEx1014.pdf

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