



Task Force

Ear Corn Drying, Storage and Handling

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An unusually high number of inquiries from extension educators and farmers regarding the harvesting and cribbing of ear corn have been received this fall. Cribbing might be a useful alternative to expedite a late, wet harvest. This fact sheet summarizes several items of importance for farmers to consider assuming that the corn has reached physiological maturity.

Naturally Ventilated Ear Corn Cribs

Ear corn will nearly always cure satisfactorily in fully exposed naturally ventilated cribs (a) if its kernel moisture content is not more than 20% when harvested; (b) if it is husked reasonably well; and (c) if there is no excessive accumulation of shelled corn or foreign material at any place in the crib.

For naturally ventilated cribs the most important dimension is the width. The narrower the crib, the freer the movement of wind through the corn and the greater the likelihood of successful natural drying. Maximum crib widths recommended for naturally ventilated rectangular cribs in Indiana are:

Northern Indiana: 4 - 5 ft wide

Central Indiana: 6 - 8 ft wide

Southern Indiana: 8 - 10 ft wide

Round cribs without interior ventilators should have a diameter not greater than 1.5 times the widths listed for the rectangular crib locations.

If the kernels contain more than 20% of moisture or if the crib is wider than recommended, the corn should be dried mechanically; or one or more ventilating ducts should be installed.

For more design details on naturally ventilated ear corn cribs, see MWPS plans 73271 for single pole, 73272 for single frame, and 73280 for double pole corn cribs available from Purdue's Farm Building Plan Service at 317-494-1173, or e-mail fbps@ecn.purdue.edu.

Mechanically Ventilated Ear Corn Cribs

Ear corn cribs of various structural types can be ventilated mechanically. Single rectangular cribs with perforated steel sheets or welded wire mesh can be equipped with an air duct on the inside or outside. Double cribs with 4 ft or 11 ft alleyways, and general purpose buildings can be equipped with properly sized air ducts down the center of the structures. Round cribs with perforated walls can be equipped with a vertical slatted center air duct. In oval-type masonry cribs a specially mounted interior air distribution duct can be installed. Round metal bins with perforated floors can also be used for ear corn drying though it is very labor-intensive to pitch fork ear corn back out of these flat-bottom bins after drying is completed.

Natural Air Drying -

Ear corn up to 30% kernel moisture can be successfully dried with forced natural air in Indiana. However, unheated air drying may not be completed in some years. Fan operation can be stopped once the ear corn kernel moisture drops below 18%, or the corn "freezes". This can keep the ear corn from going out of condition until it can be shelled and force-air dried, or until the weather warms in the spring and ear corn drying can be completed in the crib. Running the fan in the winter won't pay.

Heated Air Drying -

Ear corn up to 30% can be dried with heated air in any kind of weather. The corn to be dried should be reasonably free of husks, silks, and shelled corn. Foreign material that cannot be removed should be distributed uniformly throughout the batch. An adequate amount of drying air in an even flow through the crib should be provided. Air ducts or tunnels should be large enough to distribute the air uniformly. As a general rule, heated air temperatures should not be more than 130-140°F. For seed corn, the drying air temperature should not exceed 110°F. Supplemental heat to raise the ambient air by 10-20°F may be sufficient to assure continuous drying in most years and locations.

Heated air drying of ear corn involves a significant fire risk and a potentially significant added cost for removing the water. Last week, a drying bin filled with seed corn ears caught on fire during a stormy night in Tippecanoe County. Although the exact cause of the fire is still unclear, heated air drying has to be closely supervised.

Fan Selection and Airflow -

For forced natural or heated air crib drying, the fan should be sized to supply 5 cfm/bu for ear corn between 25 and 30% kernel moisture. This will require about 1 fan horsepower per 800 bu. Choose a fan to supply 3 cfm/bu for 25% moisture and below, which will require about 1 fan HP per 1000 bu. This assumes that the fan delivers 4000 cubic feet (CFM) of air per horsepower against a static pressure of 3/4" water gauge. Static pressure is roughly 3/4" - 1" per 12 ft of ear corn depth.

In terms of fans, ear corn fans and hay fans are preferably used because they are designed to deliver large volumes of air at the relatively low static pressures encountered in ear corn cribs. They generally have a larger diameter (32" - 40") with slim blades and a small hub. Fans designed for in-bin shelled corn drying are less suitable because they move relatively small amounts of total air flow

per horsepower at the static pressure typical in an ear corn crib.

The air duct must be designed with sufficient cross sectional area to handle the air volume involved. Generally, 1 square foot of cross-sectional area is needed per 1000 CFM of air into the corn. Shelling trenches are not of any real use as air tunnels for drying. The wet ear corn will settle by 1 - 3 ft during drying. Thus, the depth of the ear corn above the top of the duct should be about 2 ft greater than the side width to compensate for settling and the added resistance to the air flow in the lower (side) portions.

For more design details on mechanically ventilated ear corn cribs, see MWPS plans 73236 or 73238 for clear span cribs, 73281 and 73282 for double corn cribs with 4 ft and 11 ft alleys, respectively, and 73283 for a double wide corn crib with an 11 ft alley and overhead bin available from Purdue's Farm Building Plan Service at 317-494-1173, or e-mail fbps@ecn.purdue.edu.

General Considerations for Ear Corn Handling and Storage

Mechanized handling into ear corn cribs is best done with an inclined drag conveyor at about 4500 bushels per fill hole and set. Move the auger to the other fill hole(s), then start over at the first to finish filling the crib.

A clear span crib can be unloaded with a snow scoop on a tractor directly into a transport vehicle or a feed grinder without a drag conveyor. A rectangular or round crib can be unloaded by allowing the cribbed corn to flow by gravity (assisted by scooping with shovels) into a drag conveyor and transport vehicle or grinder.

Other considerations in the decision to handle ear corn involve a source for the corn picker, and the availability of suitable wagons and drag conveyors that can handle ear corn.

Cribbed ear corn can mold and spoil after the coming of warm weather in the spring if the kernel moisture content remains above 13%. The reason is that only at about this moisture will

the kernels and cob be in equilibrium. Above 13% kernel moisture, the cob moisture is significantly higher than the kernel moisture.

| Kernel versus cob moisture contents for corn. | | | | | | | | |
|--|----|----|----|----|----|----|----|----|
| Kernel moisture, % | 10 | 13 | 15 | 20 | 25 | 30 | 35 | 40 |
| Cob moisture, % | 9 | 13 | 18 | 33 | 45 | 52 | 56 | 59 |

(Source: ASAE Standards D241.3)

Moldy ear corn can create deadly respiratory problems during shelling. Approved dust masks (check the Yellow Pages for a local safety equipment supplier) should be worn to avoid inhaling mold spores. In 1993 several deaths were attributed to the inhalation of mold spores during the grinding of moldy ear corn in Indiana. Thus, it is important not to crib or store ear corn at too high of a kernel moisture!

Temporary ear corn storage may also be feasible in open top bunker silos and ground piles. However, such piles have to be closely watched for their spoilage potential. Shelling temporarily stored ear corn as quickly as possible and running the shelled corn through a heated column or bin dryer can help prevent potential spoilage problems.

Additional Resources

The "latest" publications on this subject are from the 1950's and 1960's. If you or one of your farmers need more detailed design information for a specific crib configuration, please contact me at 317-494-1175 or e-mail maier@ecn.purdue.edu and I will send you a copy of the originals I have in my files.

Grain Quality Fact Sheets can be accessed on-line through:
World Wide Web (Mosaic or Netscape) URL address:
<http://hermes.ecn.purdue.edu:8001/server/purdue/acspub.html>
(select) Grain Quality
or
Almanac:
send e-mail to: almanac@ecn.purdue.edu
message: send grain guide
or send grain catalog
or send grain factsheet#12 (for example)
or send acsonline GQ-12