



STORING SHELLED CORN in ALABAMA

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Shelled corn storage is becoming more popular throughout the nation as a means of holding corn on the farm. Reasons for the gain in popularity are: (1) shelled corn requires about one-third the space needed for corn in the shuck; (2) shelled corn can be handled more efficiently with machinery than ear corn; (3) it is easier to check shelled corn for storage damage due to weather, insects, or rodents than ear corn; (4) less trash or foreign material and insects are included in shelled corn storage than in ear corn storage; and (5) shelled corn can be protected from insects for about one-third the cost for treating corn in the shuck.

RESULTS of FARM-SIZE EXPERIMENTS

Shelled corn was stored for various periods of time up to 5 months in 400 and 500 bushel bins made of aluminum, galvanized steel, galvanized steel painted white, and exterior-type plywood.

The storage period was between January and June, 1952, at Auburn, Alabama. Grain moisture percentages at storage time were 10.6, 10.8, 12.0, and 13.2 for the 4 lots. Samples drawn from 10 locations in each bin at the end of the storage period showed no changes in chemical analyses during storage and only minor changes in moisture content. The weight changes during storage also were negligible. No differences in germination due to type of storage bin were found.

In another test, shelled corn was stored in a galvanized steel bin from December 1, 1951 to August 22, 1952. The average moisture content at the beginning of storage was 10.5 per cent and at the end of storage was 10.9 per cent. There was no loss in weight during storage. The inweight was 15,315 pounds. The average germination at end of storage was 90.4 per cent.

On February 15, 1951, 7,171 pounds of 12.2 per cent moisture corn was placed in storage. This corn was slight-

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ly infested with insects at storage time and was fumigated immediately. On June 22 the moisture content tested 11.8 per cent and the corn had lost 60 pounds in weight. Germination tested the same before and after storage.

In none of these tests did germination, weight, or grade change sufficiently to indicate a lowering of quality during the storage period. Therefore, it was concluded that shelled corn can be stored safely on the farm under Alabama conditions if certain requirements are met.

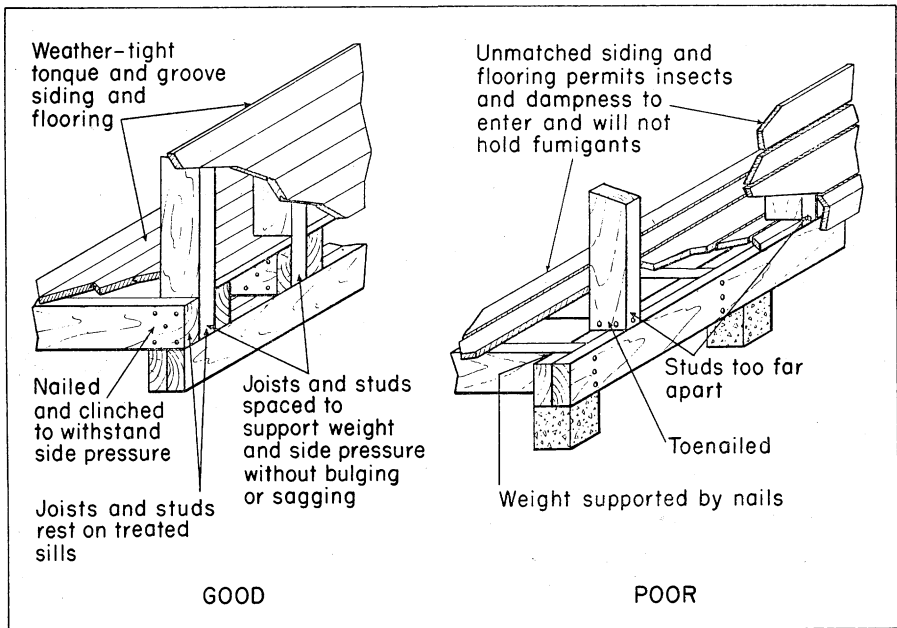
REQUIREMENTS *for* SAFE STORAGE *of* SHELLED CORN

Storage structure. A grain storage bin must be weather-tight, rodent resistant, tight enough to fumigate, and strong enough to support the weight and side-pressure of stored grain. For example, it is reported that in grain stored 10 feet deep in a 12-foot diameter bin, the force of the grain pushing

sideward against one square foot along the bottom of the wall can amount to 230 pounds.¹ A total side pressure of about 1,300 pounds would push against a one-foot strip of wall from top to bottom. Therefore, care must be taken to have wall studs sound, large enough, spaced close enough together, and securely fastened at top and bottom. Metal bins made by reputable companies are designed to withstand these pressures.

The structure should be made rat-resistant in accordance with best procedures for the particular kind of bin. The bin should have convenient emptying and filling doors that can be made tight. Facilities for frequent sampling to check on quality should be provided. A well-drained, accessible site is necessary. A convenient arrangement of bins to permit shifting from one to another or to processing facilities is desirable.

¹ Stahl, Benton M. "Grain Bin Requirements" USDA Circular No. 835, 1950.



A view showing features to keep in mind while constructing a storage bin.

Handling and inspection. Light, low-cost portable elevators are available for handling shelled corn and other grain crops. These units will fill a 1,000-bushel bin in less than an hour. The savings in labor will soon pay for a unit if much grain is handled. The elevator should not crack the grain. A flexible discharge spout is desirable to avoid accumulations of trash.

Trash and cracked or damaged grain are conducive to moisture, heating and insect damage. If scattered evenly throughout the stored grain, trash and cracked grain are less likely to cause trouble. If the percentage of this material is high, however, the corn should be cleaned before it is placed in storage.

It is extremely important to check stored corn frequently for possible accumulations of moisture and for insect and rodent signs. Moisture accumulations can result from leaky roofs, temperature changes in the stored grain, or other causes and may go unnoticed unless frequent and thorough observations are made. These observations must cover the entire lot of grain, as small damaged spots are easily overlooked. Grain probes simplify the inspection procedure.

Moisture content. The moisture content of stored corn probably is the most important single factor affecting storage. Shelled corn having too much moisture in storage will heat, become moldy, provide an ideal condition for insects, and as a result, become poorer in quality. At low moisture contents these related factors are reduced. For example, studies in other states have shown that corn stored for 2 years at 9.7 per cent moisture germinated 91.3 per cent, when stored at 11.0 per cent moisture germination was 85.2 per cent, at 12.0 per cent moisture it was 65.5 per cent, and at 14.0 per cent moisture germination was 0 per cent.

The longer corn is in storage the greater is the loss in quality. For instance, corn stored at 12 per cent mois-

ture germinated 88.3 per cent after 1 year of storage but dropped to 65.5 per cent germination after storage for 2 years.²

Storage at high temperatures causes corn to decrease in quality. Corn containing 14.6 per cent moisture was held for 2 years at 28° Fahrenheit and germinated 82 per cent. Corn at the same moisture stored for 2 years at 72° F. germinated 0 per cent.³ High temperatures prevail in Alabama, yet by lowering the moisture content sufficiently, corn can be stored safely.

Considering local climatic conditions, 12 per cent moisture is recommended as a maximum for safe storage of shelled corn for one year or less.

Corn for grain can undergo some drop in germination without the other grain quality factors being affected. However, the fact that germination decreases serves as warning that other quality factors might be affected.

Natural vs. artificial drying. Corn will usually dry to a safe storage moisture content if left in the field long enough. This procedure, however, is entirely dependent upon the weather. For machine picking, it is desirable to harvest before the stalks begin to lodge. Early harvesting also reduces field losses from insects, birds, stray livestock, and weather. However, corn harvested early is likely to contain too much moisture for safe storage. When this is true, it will be necessary to artificially dry the corn to the safe storage moisture content.

General information concerning fans, motors, and supplemental heat is given in A.P.I. Agricultural Experiment Station Leaflet No. 33, "Aids to Planning

² Semeniuk, G., Nagel, C. M., and Gilman, J. C. "Observations on Mold Development and on Deterioration in Stored Yellow Dent Shelled Corn." Iowa Agricultural Experiment Station Research Bulletin 340, 1947.

³ Sayre, J. D. "Storage Tests with Seed Corn" Farm and Home Research 32: 149-154. 1947.

an Artificial Curing System for Hay." For shelled corn drying, a blower capable of delivering a minimum of 4 CFM (cubic feet per minute) of air per cubic foot of grain (or 5 CFM per bushel of grain) is recommended. More air will give faster drying. Further, the fan or blower must deliver this volume of air even though the grain offers resistance to air flow. To overcome this resistance the blower should deliver the recommended air flow against 1" SP (static pressure) for corn stored 4 feet deep or against 2" SP if stored 6 feet deep.

If supplemental heat is used, a maximum temperature of 110° F. is recommended for drying *seed* corn. Fuel and electricity costs for drying range from 1 to 5 cents per bushel depending upon moisture contents, weather conditions, and efficiency of the drier. Someone familiar with the design and operation of driers should be consulted before selecting equipment or planning a drying bin.

Protection against insects. The principal insect pests of shelled corn in storage in Alabama are the rice weevil, the Indian and the Angoumois grain moths, the cadelle, and the yellow meal worm. These pests can be economically controlled if proper control measures are followed.

Bins should be thoroughly cleaned before corn is placed in them. After cleaning, the entire inner surface should be sprayed with a DDT solution using 2 pounds of 50 per cent wettable DDT powder to 5 gallons of water or ½ gallon of 25 per cent emulsifiable concentrate to 4 gallons of water. To give thorough coverage will require about 2 gallons per 1,000 square feet of surface area.

Fumigation is an economical and effective method of controlling insects in stored grain. For fumigation to be effective a bin must be made practically

air tight by sealing doors and other openings with masking tape.

The following fumigants are recommended at the specified rates:

1. Ethylene dichloride-carbon tetrachloride, 3 to 1 mixture, applied at the rate of 5 gallons per 1,000 cubic feet in steel bins or 6¼ gallons in wooden bins.

2. Carbon tetrachloride and carbon disulphide, 4 to 1 mixture, applied at the rate of 5 gallons per 1,000 cubic feet in steel bins or 6¼ gallons in wooden bins.

3. Methyl bromide, applied at the rate of 1 pound per 1,000 cubic feet. Methyl bromide fumes are highly toxic to warm-blooded animals as well as insects. Extreme care should be exercised to prevent exposure to it.

CAUTION: The gasses given off by all fumigants are toxic to man and animals. Although some are more hazardous than others, caution should be used to prevent exposure to any fumigants.

Protectant dusts containing 0.05 per cent pyrethrins and 0.8 per cent piperonyl butoxide are effective for several months in preventing insect damage in uninfested or very lightly infested shelled or shucked ear corn. The dust should be applied at the rate of 1 pound to 10 bushels of corn and thoroughly mixed with the grain. The top 3-inch layer of grain in a bin should be "capped" with 2 or 3 times the above rate of dust.

For complete information, see A. P. I. Agricultural Experiment Station Leaflet No. 40, "Control of Insects in Stored Grain."

CONCLUSION

Clean, shelled corn of good quality containing 12 per cent moisture or less can be stored on the farm for as long as one year without loss in quality if placed in adequate storage structures and protected from insects.