Although drying grain and selling it directly to an elevator is certainly an option open to the farmer, most farmers who dry their grain store it as well. The reasons for farm storage are numerous and include:

1) More flexibility in marketing
2) Maintenance of quality
3) Utilization of available labor and equipment
4) Inadequate commercial facilities
5) More efficient on-the-farm feeding
6) Other conveniences.

Whatever the reason for storing grain on the farm, there is always a need for proper planning and a complete analysis of the economic implications of the storage system. The primary factors which need to be considered in such an analysis are outlined and discussed in the following paragraphs.

**COST OF STORAGE FACILITIES**

What does farm storage cost? To answer this question many factors must be considered. To begin with, farm storage involves more than just storage bins. Grain handling equipment must also be included. In addition, certain items that are necessary in order to use a particular drying method might be considered as part of storage. For example, perforated floors are required for layer drying but not for continuous flow drying, yet the floors are permanently attached to the storage structure and aid in aeration. Likewise, drying fans may serve a dual role as aeration fans. Grain handling presents a similar situation in that the same equipment may be used in both drying and storage. These examples illustrate the difficulty in separating equipment costs for drying and storage. Therefore, it is usually better to assign the complete facility cost for both drying and storage to storage, keeping in mind that the net profit will not be affected when the entire system is analyzed. It should also be noted that the per bushel cost for the overall grain handling, drying, storage and feed processing system will usually decrease when utilizing dual-role types of equipment so long as the timeliness of the overall operation is not affected.

The costs for drying, storage and handling equipment will also be influenced by other factors. These include the total bushels to be stored, drying method, bin size, number of bins, degree of mechanization, expansion plans and harvest rate. With regard to these factors, the following economic guidelines with regard to facility cost can be applied:

1) As the capacity of the facility increases, the facility cost per bushel usually decreases.
2) The least cost drying technique depends on the quantity of grain to be processed and stored with no single method being the least expensive for all capacities.
3) It is generally more economical to build the fewest number of bins possible for a given capacity and farm situation. However, under most conditions it is better to increase the number of bins rather than have bin eave heights exceed approximately 24 ft. (9 rings @ 2 2/3 ft/ring). For layer drying systems the usual limit is 16 ft. (6 rings @ 2 2/3 ft/ring).
4) As facility size increases, a smaller proportion of the cost is for handling equipment.
5) If the facility is designed with expansion in mind, the potential increase in capacity may warrant a different drying technique in the original structure.
6) Harvest rate is the single most important factor in selecting a drying technique.

Considering all these factors, the annual cost for grain storage facilities varies over a large range and each farmer must evaluate his own system to determine his annual cost. Depreciation, interest, taxes, insurance and repair costs must be considered. Figures 1-3 and 4-6 provide an annual
Figure 1: Annual cost for layer drying facility, 20 day harvest time.

Figure 2: Annual cost for batch-in-bin drying facility, 20 day harvest time.

Figure 3: Annual cost for a portable drying facility, 20 day harvest time.

and purchase cost estimate, respectively, for similar systems with different drying techniques. The producer may obtain an estimate of his annual cost by comparing his facilities with those presented in these figures.

OVERDRYING COST

With regard to drying and selling grain immediately to the local elevator, it's best not to dry the grain below the base moisture content, which for corn is usually 15.5%. Unfortunately, most corn cannot be stored at the base moisture content for long periods of time without assuming some risk of spoilage. The suggested long term storage moisture content of grain varies with the geographic area of the country. For corn stored in the northern states, a storage moisture content of 14% is suggested with this value being approximately 12% in the southern states. Kentucky weather conditions require the corn to be stored at 13% for adequate safety. What this means to the farmer is that if he intends to store his grain until the following spring or summer, he will have to dry his corn past the base moisture content and therefore lose some crop value should he sell to an elevator with a 15.5% base moisture content. For corn dried from 15.5% to 13.5%, the loss would be 2.31% (Table 1) or approximately 7¢/bu. for $3.00 corn. For the same corn dried to 10%, the loss would be slightly over 18¢/bu.

The point to remember is that drying to moisture levels below the base moisture content results in a reduction of saleable product and this loss must be viewed as a necessary storage expense. However, drying grain below the moisture content required for safe storage is a waste of fuel and will result in unnecessary economic loss.

Table 1: Percent Weight Loss For Grain Dried Below the Base Moisture Content.

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<th>Grain Moisture Content, %</th>
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INTEREST, INSURANCE AND TAXES

Interest may be the single most expensive storage cost. If grain had been sold at harvest, interest could have accumulated on the sale or existing debts could have been paid. If a 6% annual interest rate is assumed, the charge per month of storage would be approximately 0.5%. Grain harvested on the 1st day of November and stored until June 1 would have an interest charge of 10.5¢/bu. based on an average value over the storage period of $3.00/bu. For a 10% interest rate the expense would be 17.5¢/bu. under similar conditions. Note that the interest rate should be assessed against the average value of the grain over the entire storage period rather than on the value at harvest or at the time of sale.

Insurance and taxes on stored grain will vary with local conditions but will usually be no more than 1% of the grain’s value. For $3.00 corn, this would mean that somewhat less than 3¢/bu. in insurance and taxes must be charged to storage.

COMMERCIAL STORAGE COST

How does farm storage compare to commercial storage? In 1973, it cost the average country elevator in the U.S. 22.1¢/bu. per year for storing and handling grain. The variation from one region to the next was usually less than 2¢ either way, with the major corn producing states averaging 22.15¢/bu/yr. This indicates that the average elevator must charge over 22.1¢/bu/yr. to make any profit on its storage. Remember the 22.1¢/bu. does not include drying, so it may be possible for the elevator owner to charge less than his actual costs for storage and still make an overall profit through his drying enterprise. This again illustrates the need for considering the entire harvesting and marketing system when evaluating the economics of farm storage and drying.

INCREASE IN VALUE OF STORED GRAIN

The expenses of farm storage and drying have been discussed. What now needs to be considered is how much the stored grain increases in value over the storage period. This increase varies from year to year and is a function of local, national and world conditions. In years with a grain surplus, the increase in value may be slight. In years when the demand is great, the increase in value of stored grain is large.

In Ohio, the average price increases for corn during the ten year period between 1957 and 1967 was 12¢/bu. for grain sold in May. The average price at harvest during this same period was $1.17/bu., representing an increase in value of approximately 10%.

From 1961 to 1971, farmers in southwestern Indiana averaged a 25¢/bu. increase in value of their stored corn. During this time, the average corn price at harvest was 1.06¢/bu., the increase in value being 23.6%. These two examples illustrate that the returns for stored grain may turn a good investment in one location into an exceptionally profitable enterprise in another area. A true analysis of expected return requires a thorough knowledge of the local market conditions. To take either extreme would be a misrepresentation of the returns that might normally be expected for a particular area. However, an average increase in value of 10-25% would usually cover the range of reasonable expectations.

GRAIN STORED FOR FEEDING PURPOSES

If the grain is to be fed, the expenses for storage should be adjusted in that losses due to overdrying are not considered. This is because there is little difference in dry matter content or nutritional value for overdried grain as compared to grain at the base moisture content.

If the grain is to be fed, the savings resulting from farm-stored grain, as compared to grain purchased off the farm, should be considered. Also, grain may usually be purchased at a reduced price during the harvest period.

For grain stored and fed on the farm, the gross return for storage is the average value of the stored grain over the storage period minus its value when placed in storage. This assumes that grain will be fed uniformly over the storage period.

SUMMARY

When determining the feasibility of grain storage, many factors must be considered. These include facility cost, overdrying cost, interest, taxes and insurance costs and expected gross return. The expected net return to storage is dependent on whether the grain is sold from storage or fed on the farm and whether all drying, handling and dual purpose processing equipment is charged to storage. This again emphasizes the importance of considering the total farm system when evaluating the economics of storing grain.

REFERENCES CITED


Figure 4: Purchase cost for layer drying facility, 20 day harvest time.

Figure 5: Purchase cost for batch-in-bin facility, 20 day harvest time.

Figure 6: Purchase cost for portable drying facility, 20 harvest days.