MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 487

Grain Marketing: Storage Decisions

Introduction

Many farmers in Maryland have constructed bins to store their grain. However, having bins does not necessarily mean they should be used. A farmer should first calculate the cost of storing the grain, and should only consider storage if the cost is less than the expected increase in price after harvest. Otherwise, selling at harvest and leaving the bins empty could result in a bigger profit. The farmer should not automatically fill bins to capacity each year unless he or she is storing grain for onfarm consumption.

Cost of Storing Grain

Fixed Costs of Grain Bins
Fixed costs of structures and equipment refer to costs that exist whether a particular item is used or not. These costs are often described as the DIRTI 5, which stands for depreciation (D), interest on average investment (1), repairs (R), taxes (T), and insurance (I). The DIRTI 5 is sometimes expanded to include the cost of shelter for machinery. Repairs are sometimes considered to be a variable cost rather than a fixed cost, since they may be a function of use.

These issues aside, fixed costs are invariable and are stated on an annual basis. A $100,000 six-row combine might have an annual fixed cost of $20,000 (calculated from the DIRTI 5). This $20,000 cost exists whether the combine is kept in the shed or is used to harvest 800 acres. Fixed costs per acre decline with increased usage, but total fixed costs remain the same.

The DIRTI 5 can be used to calculate the fixed costs of grain bins. These are real costs that a farmer should consider before buying a new bin. By estimating the average total number of bushels stored, one can derive the fixed cost per bushel. The fixed cost per bushel plus the individual's variable cost per bushel equals the total cost of storing. The usual increase in prices after harvest in the local marketing region should be greater than these combined costs. If not, building the bins cannot be justified.

Once the bins are built, however, fixed costs play no part in the annual decision to store and the farmer should completely ignore them. Only the variable cost of storing is pertinent. Fixed costs are excluded because they always exist.

Example. Suppose that a farmer has fixed costs of $10,000 for his or her bins. Corn can be sold at harvest for $2.40 per bushel. It costs 18 cents per bushel (variable cost) to store the corn until March. The farmer expects prices in March to average $2.52 (forward contract bid from the local elevator). Even though this price is 12 cents higher, the producer loses 6 cents a bushel by storing instead of selling at harvest because of variable storage costs. If the farmer does not have sufficient revenue to

cover fixed costs, storing the grain will only increase the amount of debt. In this case, the producer minimizes his losses by selling at harvest. Alternatively, if fixed costs can be paid, the producer maximizes profits by selling in the fall. Either way, only the variable costs are an important consideration in the decision to store.

Variable Costs
Several types of variable costs should be included when calculating the onfarm cost of storage. These include interest, fuel expenses, grain shrinkage, labor and quality deterioration.

Interest expense is more accurately defined as the opportunity cost of money. It is generally the most expensive of these costs and, unfortunately, the one most overlooked. With revenue gained from grain sold at harvest, producers can reduce the principal, and subsequently the interest expense on existing debt. For the fortunate few who have no debts, they can put the money in the bank to earn interest. Either way, revenue can work for the farmer in a way grain locked in a bin cannot.

Another variable cost is the fuel necessary to dry grain to the moisture level required for safe storage. The moisture level chosen by the farmer depends on how long the grain will be stored. Lower moisture levels are necessary if the grain is to be carried over into the warmer spring months rather than being stored just for the winter. Considering this factor, typical moisture levels for safe storage are 13 to 14 percent for corn and 13 percent for wheat and barley. Farmers sometimes dry their grain slightly more to provide a margin that will ensure quality. However, grain shrinks when it is dried and this lost volume also represents a cost.

In Maryland, soybeans are generally considered dry enough when harvested for storage or just air-dried. Small grains typically are not stored long since the bins are needed for corn and soybeans. Given current practices, drying costs (fuel and shrinkage) usually refer to corn storage.

An additional cost is the labor necessary to monitor the grain while it is stored on the farm. If the grain's quality should decline during storage, price dockage will also be an expense.

The grain storage worksheet provides an example of the cost of storing corn until March 31. A copy is provided at the end of this fact sheet for the reader to copy and use on his or her farm.

Fill out this worksheet completely to avoid omitting important information and for reference in the future years. It is self-explanatory except for perhaps the production year. The 1988-89 production year refers to corn harvested in 1988 and marketed until the next harvest in 1989. Winter wheat harvested in 1988 would also be classified as a 1988-1989 production year even though it was planted in the fall of 1987.

Definitions

Interest. The farmer in our example has an equipment loan carrying an interest rate of 10 percent. By not selling at harvest, the principal cannot be reduced. Consequently, the interest will continue to accrue for 5 months until the corn is sold, which amounts to 10 cents per bushel. In the more general case where the farmer has several loans or uses for the money, the interest rate chosen reflects the average cost of borrowing, if he or she has debts, or the return of money in other enterprises.

Drying Costs. To dry 20,000 bushels of corn an additional 2 percent (15.5 to 13.5 percent) requires 775 gallons of LP gas. Fuel requirements vary considerably with the particular type of dryer used. The farmer obtained this quantity from last year's records and used the current price of fuel. Drying costs 3.1 cents per bushel.

Shrinkage. The harvest price of $2.40 is quoted on a 15.5 percent moisture basis. By drying the corn to

13.5 percent to maintain quality, the corn shrinks in volume. Since corn is sold by volume (bushels), there is less corn to sell. Table 1 shows common shrinkage factors for grain in this range of moisture. The corn shrinks 2.81 percent, which costs 6.7 cents per bushel.

Labor Costs. The farmer estimates that it will take approximately 30 minutes per day to monitor the grain. For 5 months that amounts to 75 hours. To pay somebody to perform that chore would cost $4 per hour, so the farmer charges himself or herself that wage since time is valuable. Labor costs related to storage are 1.5 cents per bushel.

Quality Discounts. If the corn is sold before summer, the producer does not have any problem maintaining quality, hence no cost is involved. Price discounts would be included here.

Other. A category is provided for other costs not mentioned a farmer might incur, and which do not fall under any of the previous headings.

Total variable costs of storing are 21.3 cents. Since the grain could be sold at harvest for $2.40 per bushel, the farmer needs to sell it for $2.61 or more in March in order to break even and justify storing. The longer the farmer stores the grain, the greater the variable costs and break-even price will be. Interest, labor and the danger of quality deterioration all continue to increase with time.

Summary

This worksheet can be adjusted for the farmer using commercial storage or renting bin space from a neighbor. The "other" category can be used to include the rent per bushel. The remaining categories may be kept or deleted as applicable to the particular circumstance.

Table 1. Grain shrinkage factors*

Initial moisture (percent)	When grain is dried to these levels					
	13.0 (percent)	13.5 (percent)	14.0 (percent)	14.5 (percent)	15.0 (percent)	15.5 (percent)
15.5	3.37	2.81	2.24	1.67	1.09	--
16.0	3.95	3.39	2.83	2.25	1.68	1.09
16.5	4.52	3.97	3.41	2.84	2.26	1.68

* To use, divide the appropriate shrinkage factor by 100 and multiply by the harvest price.

Grain Storage Worksheet

Crop Corn Marketing Year 1988/89 Bushels Stored 20,000

Harvest Price (HP) $2.40/bushel at 15.5%Moisture

Harvest Month October Prospective Delivery Date March 31

Variable Storage Costs

	$/bushel	
1. Interest expense:		
(HP x interest rate) x No. of months stored/12=		
(2.40 x .10) x5/12 =	.100	
2. Onfarm drying costs:		
(Gallons of fuel x $/gal)/ bushels stored =		
(775 x .81)/ 20.000 =	.031	
3. Shrinkage costs:		
Shrinkage factor* for (15.5% to 13.5%) x HP =		
.0281 x $2.40 =	.067	
4. Labor costs:		
(Total hours x $/hour)/ bushels stored =		
(75 x $4.00) / 20,000 =	.015	
5. Quality discount:		
HTP x price discount =		
$2.40 x0=	.000	
6. Other:	.000	
_____=	.213	(1)
	2.40	(2)
Total variable costs of storing (Add #1 thru #6)	2.61	
Harvest price =		
Break-even storage price for March 31 [(1) + (2)] =		

* Obtained from Table 1

Grain Storage Worksheet

Crop ____ Marketing Year _____ Bushels Stored _____

Harvest Price (HP) _____ at _____Moisture

Harvest Month _____ Prospective Delivery Date _____

Variable Storage Costs

1. Interest expense:

(HP x interest rate) x No. of months stored/12= $/bushel

(____ x ____) x____/12 =

2. Onfarm drying costs: _____

(Gallons of fuel x $/gal)/ bushels stored =

(_____ x ____/ _____ = _____

3. Shrinkage costs:

Shrinkage factor* for (_____% to ____%) x HP = _____

____ x ____ =

4. Labor costs: _____

(Total hours x $/hour)/ bushels stored =

(____ x ____) / _____ = _____

5. Quality discount:

HTP x price discount = _____

____ x ____ =

6. Other: _____ (1)

_____= _____ (2)

_____

Total variable costs of storing (Add #1 thru #6)

Harvest price =

Break-even storage price for March 31 [(1) + (2)] =

Note: This is one in a series of 15 fact sheets on "Grain Marketing"

Grain Marketing: Storage Decisions

by

James C. Hanson
farm management specialist
James R. Russell
agricultural marketing specialist
Department of Agriculture and Resource Economics

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, University of Maryland, College Park, and local governments, Thomas A. Fretz, Director of Maryland Cooperative Extension, University of Maryland.

1989