Determining Grain Storage Costs

NORTH DAKOTA STATE UNIVERSITY

3 0109 00595 3941

COOPERATIVE EXTENSION SERVICE
North Dakota State University Fargo. North Dakota 58105

Tom Reff
Extension Farm Management Economist

What does it cost to store grain? What should I charge to rent my empty bin space? Answering these questions is not easy because costs vary depending on the type of building, type and size of equipment, value of grain, interest rates, etc., as well as which costs need to be considered. For example, only fixed costs need to be considered to answer the rental question, since the person renting the storage is expected to pay variable costs.

The included worksheet can be used to guide in determining grain storage costs. Income tax effects of the purchase of a grain bin are not included in the worksheet. An example is used to explain the various items on the worksheet. A blank worksheet is provided to use for an individual storage facility.

INVESTMENT COSTS

The first part of the worksheet is for entering investment costs. Frequently only the price of the bin is advertised, which does not include erection costs. Guidelines are provided to estimate erection costs and the cost of a concrete floor. These are guidelines only; costs can vary greatly depending on cost of labor and materials. Costs of equipment will also vary by size and manufacturer. In the example, a 7,816 bushel bin will cost $8,363, or $1.07 per bushel to erect (line L ÷ line M).

ANNUAL STORAGE COSTS

The second part of the worksheet shows a procedure to calculate annual storage costs. This procedure results in an economic cost. That is, the building and equipment are depreciated over their expected useful lives. Interest is charged on the

average investment over their expected useful lives. Fixed costs for building repairs and insurance are estimates based on the investment costs.

Fixed Costs

Fixed costs include those costs that continue whether the bin is used or is empty. Including fixed costs in determining grain storage costs depends on whether you are planning a new building or have a used building on hand.

Fixed costs on an existing building need not be included in a grain storage decision. For example, if you are trying to decide whether to sell at harvest compared to storing, consider only variable costs.

However, if a new building is planned all costs must be considered. The reason is that until the new building is constructed, all costs are variable.

In the example, the fixed cost of 14.23 cents per bushel is the minimum amount to be used as a guide in renting this grain storage building. It is the annual fixed cost per bushel. If rent were to be determined on a monthly basis, divide 14.23 cents by 12 months to get a monthly rate (14.23 ÷ 12 = 1.186 cents per bushel per month). This would be a minimum rate because fixed costs are just covered. No return for risk and profit are included. However, in renting an existing building, the minimum rate might be less than the fixed cost in order to be competitive when considering there would be no return if left empty.

Variable Costs

The variable costs are the costs for operating and

repairing the equipment, shrink, cost of insurance, a management charge, labor and trucking into and out of storage, and interest on investment on the grain in storage.

Electricity costs for aeration and augers will vary by size of motors, how many hours of aeration are used, and cost of electricity per kilowatt hour (KWH). An estimate of electricity costs can be made by multiplying the cost per KWH times a factor of .10 to .25 per bushel. The lower factor (.10) will be typical in North Dakota under fall and spring humidity conditions.

Equipment repairs are estimated at 3 percent of building and equipment investment (line K on the worksheet).

Shrink can also vary. A guideline of 1 percent of the value of a bushel of grain is used.

Insurance on grain is estimated at .05 percent of the price of grain.

Management costs of stored grain are subjective and will vary with each farm manager. In the example a 1 cent charge per bushel for mangement is made resulting in a cost of $78.16 per year (assuming full capacity) for this particular bin.

The sub-total (line Y) may be used to compare with commercial storage rates.

Labor and trucking charges into and out of storage need to be estimated. Since grain must be trucked from the field anyway, either to storage or to market, this cost represents a minimal handling charge. In the example a charge of 2 cents per bushel is estimated.

Interest on grain is the largest of all storage costs. The rate of interest charged may be 1) the rate of an existing loan which the value of the grain could pay off, or 2) the potential rate of return from an investment from the proceeds of a grain sale. In the example, a 10 percent interest rate is used times the value of a bushel of wheat (10% × $3.65 = 36.5 cents) as are annual cost (i.e. for 12 months). If the grain is in storage less than 12 months the rate should be prorated for the number of months in storage. For example, if the grain is stored for 7 months, the rate is 7/12 × 36.5 cents = 21.3 cents.

In the example, variable costs per bushel are $.4488. The variable cost is the amount to use in deciding whether to store or sell at harvest when an existing bin is used.

In planning a new facility, the total annual storage cost of $.5911 is the amount that should be considered.

CASH FLOW

Before investing in grain storage a producer may wish to know the effect of the investment on his cash flow. To do this substitute the annual principal and interest payments for lines N, O and P of the worksheet. For example, if the cost for the building and equipment of $8,363 is borrowed at 11 percent for three years, the equal annual payments would be $3,422.22. Annual payments per bushel will be 43.78 cents ($3,422.22 ÷ 7,816 bu. = 43.78 cents/bu.). Total annual storage costs for the example, in terms of cash flow for each of the three years of the loan, would be 89.91 cents per bushel.

GRAIN STORAGE COST WORKSHEET
—Example—

Initial Investment Cost

Building (bin)

Purchase price of building	$4,257	(A)
Erection costs (15% of A)	639	(B)
Concrete floor (17% of A)	724	(C)
Total building investment (A + B + C)	$5,620	(D)

Equipment

Aeration ducts and pad	$ 600	(E)
Aeration fan and motor	370	(F)
Grain spreader	183	(G)
Unloading tube and well	400	(H)
Bin sweep auger	890	(I)
Unloading auger and motor	300	(J)
Total equipment investment (E + F + G + H + I + J)	$2,743	(K)
Total investment (D + K)	$8,363	(L)
Capacity of bin (bushels)	7,816	(M)

Annual Storage Costs

Fixed Cost[1]

	Annual		$/bu.	
Depreciation—Bldg. (D ÷ 20 yr.)	$ 281.00	(N)		
—Equip. (K ÷ 10 yr.)	274.30	(O)		
Interest on investment (½ L × 11%)	459.97	(P)		
Building repairs (D × 1.0%)	56.20	(Q)		
Insurance (L × .05%)	41.82	(R)		
Annual Fixed Cost (N + O + P + Q + R)	$1,113.29 ÷ M		= $.1423	(S)

Variable Cost

Electricity, aeration and augers ($.05/kwh × 0.10 to 0.25 kwh per bu.)			$.0050	(T)
Equipment repairs (K × 3.0% ÷ M)			.0105	(U)
Shrink ($3.65/bu. × 1.0%)			.0365	(V)
Insurance on grain ($3.65/bu. × .05%)			.0018	(W)
Management of stored grain			.0100	(X)
Subtotal[2] (T + U + V + W + X)	$.0638	(Y)		
Labor and trucking (in and out of storage)			.02	(Z)
Interest on grain ($3.65/bu. × 10%)[3]			.365	(Z₁)
Annual Variable Cost (Y + Z + Z₁)			$.4888	(Z₂)
TOTAL ANNUAL STORAGE COST (S + Z₂)			$.5911	(Z₃)

[1]Principal and interest payments may be substituted for depreciation (N and O) and interest (P) to reflect costs on a cash flow basis.

[2]This amount may be compared to commercial storage rates.

[3]Interest on grain is shown on an annual basis. Prorate if less than 12 months are used.

GRAIN STORAGE COST WORKSHEET

Initial Investment Cost

Building (bin)

Purchase price of building	_____ (A)
Erection costs (15% of A)	_____ (B)
Concrete floor (17% of A)	_____ (C)
Total building investment (A + B + C)	_____ (D)

Equipment

Aeration ducts and pad	_____ (E)
Aeration fan and motor	_____ (F)
Grain spreader	_____ (G)
Unloading tube and well	_____ (H)
Bin sweep auger	_____ (I)
Unloading auger and motor	_____ (J)
Total equipment investment (E + F + G + H + I + J)	_____ (K)
Total investment (D + K)	_____ (L)
Capacity of bin (bushels)	_____ (M)

Annual Storage Costs

Fixed Cost[1]

	Annual	$/bu.
Depreciation—Bldg. (D ÷ 20 yr.)	_____ (N)	
—Equip. (K ÷ 10 yr.)	_____ (O)	
Interest on investment ($\frac{1}{2}$ L × _____%)	_____ (P)	
Building repairs (D × 1.0%)	_____ (Q)	
Insurance (L × .05%)	_____ (R)	
Annual Fixed Cost (N + O + P + Q + R)	_____ ÷ M	= _____ (S)

Variable Cost

	Annual	$/bu.
Electricity, aeration and augers		
($_____/kwh × 0.10 to 0.25 kwh per bu.)	_____ (T)	
Equipment repairs (K × 3.0% ÷ M)	_____ (U)	
Shrink ($_____/bu. × 1.0%)	_____ (V)	
Insurance on grain ($_____/bu. × .05%)	_____ (W)	
Management of stored grain	_____ (X)	
Subtotal[2] (T + U + V + W + X)	_____ (Y)	
Labor and trucking (in and out of storage)	_____ (Z)	
Interest on grain ($_____/bu. × _____%)[3]	_____ (Z₁)	
Annual Variable Cost (Y + Z + Z₁)		_____ (Z₂)
TOTAL ANNUAL STORAGE COST (S + Z₂)		_____ (Z₃)

[1]Principal and interest payments may be substituted for depreciation (N and O) and interest (P) to reflect costs on a cash flow basis.

[2]This amount may be compared to commercial storage rates.

[3]Interest on grain is shown on an annual basis. Prorate if less than 12 months are used.