Cost-Use Relationships for Crop Drying

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The relationships between crop drying cost and volume dried are developed for five drying systems used on farms. Cost per unit dried are presented for both wheat and sunflower as an aid in the selection of an optimum system for particular situations.

The profitability of artificial crop drying to a farm operation depends on the average cost of owning and operating the drying system. Average drying costs were recently developed for five drying systems commonly used by North Dakota farmers. These costs were computed for a five point moisture reduction for two crops, wheat and sunflower. Results of this analysis are useful for determining the most economical type and size dryer for a particular farm operation. Cost data are also useful to farmers who are weighing the costs and benefits of on-farm crop drying against those for commercial drying.

Average drying costs were computed for the following five drying systems:[1]

(1) A 110 bu./hr. batch-in-bin system.
(2) A 150 bu./hr. recirculating batch system.
(3) A 200 bu./hr. recirculating batch system.
(4) A 250 bu./hr. continuous flow system.
(5) A 500 bu./hr. continuous flow system.

Investment and Costs

Drying costs are conveniently divided into ownership and operating costs. Ownership costs are those which are not affected by the amount of use and occur even if the dryer is not used. Included in ownership costs are depreciation, interest, and insurance charges.

Operating costs are those that vary according to the amount that a dryer is used. The components of the operating cost include repair and maintenance, fan operation, fuel, and labor. Once a dryer has been purchased, it would pay to operate it as long as the benefits exceeded the operating costs.

Cost comparisons for the five drying systems are based on the following conditions:

Outside Air Temperature	- 50°F
Drying Air Temperature (wheat and sunflower)	- 150°F in recirculating batch and continuous flow dryers and 130°F in batch-in-bin dryers
Interest Rate	- 7 per cent of the average lifetime value
Insurance Rate	- 0.8 per cent of the average lifetime value
Depreciation	- 8.33 per cent of initial investment cost (based on a 12-year life or 2,500 hours of use)
Repair Cost	- 1 per cent to 10 per cent of initial investment cost (depending on hours of annual use)
Propane Cost	- 40¢/gallon
Electricity Cost	- 2.2¢/kwh
Labor Cost	- $3.75/hour
Average Moisture Reduction	- 5 per cent wet weight

Investment requirements for the five drying systems are given in Table 1. Note that for the batch-in-bin drying system, the cost of the bin is not included but the price does include recirculating equipment costs. The price of the continuous flow system includes two augers and a holding bin. Costs for all systems include a 10 per cent price discount on equipment, a 2 per cent sales tax, labor and installation charges, propane tank costs, and are adjusted for investment tax credit.

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[1] *Capacity ratings are given for drying wheat. These ratings are not manufacturers' suggested capacity ratings. Rather, they have been corrected and standardized based on drying temperature and air flow rate. The drying capacity for sunflower is computed as follows: bu./hr. drying rate for wheat x 2 (double the drying rate for wheat) x 28 lb./bu. ÷ 100 lb./cwt. = cwt./hr. drying rate for sunflowers.*

Table 1. Investment Requirements for Five Drying Systems, 1977

System	Components	Total Investment Cost
110 Bu./Hr. Batch-in-Bin (18' diameter)	Drying unit (15,700 cfm, 1.8 million Btu), grain spreader, stirrator, portable auger, unload auger with bin sweep	$ 7,586
150 Bu./Hr. Recirculating Batch	Dryer	5,796
200 Bu./Hr. Recirculating Batch	Dryer	6,694
250 Bu./Hr. Continuous Flow	Dryer, portable auger, mounted auger, holding bin (2,100 bushels)	19,632
500 Bu./Hr. Continuous Flow	Dryer, portable auger, mounted auger, holding bin (4,000 bushels)	28,272

Annual ownership costs were derived from the total investment costs by applying an annual ownership rate to each drying system (Table 2). Ownership costs per unit dried can be calculated by dividing the annual ownership cost for a particular drying system by the annual volume dried. For example, the ownership cost per bushel for a 200 bu./hr. recirculating batch dryer at 10,000 bushels dried annually is 8.7¢ ($869.52/year ÷ 10,000 bu/year).

Table 2. Annual Ownership Costs and Per Hour Operating Costs for the Removal of Five Points of Moisture in Wheat for Five Drying Systems, 1977

Drying System	Annual Ownership Cost	Per Hour Operating Cost Annual Use 0-80 Hrs.	81-200 Hrs.
110 Bu./Hr. Batch-in-Bin	$ 985.39	$ 7.78	$ 8.56
150 Bu./Hr. Recirculating Batch	752.86	17.61	18.28
200 Bu./Hr. Recirculating Batch	869.52	19.82	20.61
250 Bu./Hr. Continuous Flow	2,550.18	18.38	20.31
500 Bu./Hr. Continuous Flow	3,672.56	31.35	34.10

Operating costs for the removal of five points of moisture in wheat for each drying system are given on a per hour basis (Table 2). Operating costs may be slightly greater for sunflower than small grain drying because sunflower drying typically uses more labor to guard against fires. Operating costs per unit dried can be calculated from the estimates given by dividing the per hour operating cost by the bushels dried per hour. For example, the operating cost per bushel in a 200 bu./hr. recirculating batch dryer at 60 hours of annual use is 9.9¢. ($19.62 ÷ 200 bu./hr.).

Cost-Volume Comparisons

The relation between average drying cost and volume dried for wheat and sunflower is presented in Figures 1 and 2. Average drying costs decrease with volume dried for all drying systems due to the effect of declining average ownership costs. Average operating costs remain nearly constant for each drying system regardless of the volume annually dried.

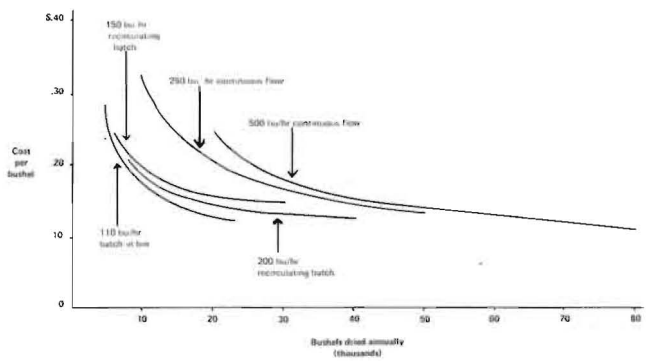

Figure 1. Average Drying Costs for the Removal of Five Points of Moisture in Wheat for Five Drying Systems.

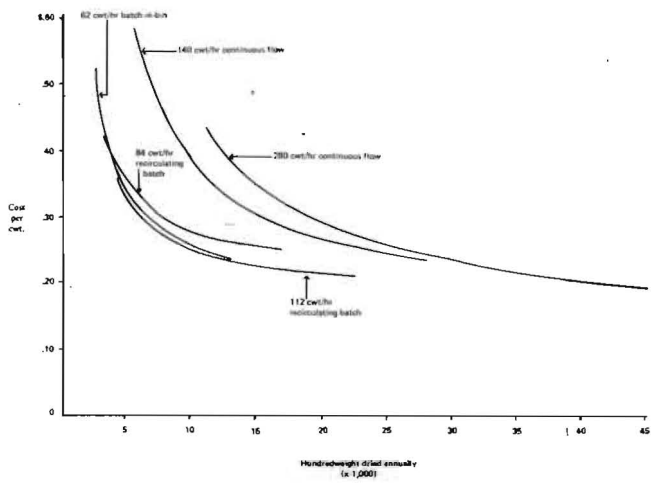

Figure 2. Average Drying Costs for the Removal of Five Points of Moisture in Sunflower for Five Drying Systems.

Ownership cost comprises the greatest percentage of the average drying cost at low annual volumes. Ownership costs are also larger for greater capacity dryers. Investing excessively in drying capacity can, therefore, greatly raise the average cost of drying. Hence, a farm operator's required annual drying capacity should be a prime consideration in selecting the most economical drying system.

Commercial Drying

Commercial drying has the potential to be a less costly alternative to on-farm drying for low volume drying needs. The cost of commercial drying to the farmer depends on where the grain is dried and where it is sold or stored. A farmer who dries at an off-farm facility and does not sell or store the crop at that facility has the transportation cost of hauling the grain to and from the dryer, in addition to the charge for drying. Drying grain at a neighbor's facility is a good example of such a situation. A farmer who dries grain at a commercial facility, however, and sells or stores the grain at the same location realizes only a drying cost since the grain must be hauled to market anyway.

Custom rates for drying grain vary considerably statewide. The North Dakota Crop and Livestock Reporting Service reported average drying costs for 1977. These rates have been adjusted for the removal of five points of moisture and are presented in Table 3.

Table 3. Costs of Commercial Crop Drying in North Dakota, 1977

Crop	Range in Rates	Average Rate Adjusted for 5% Moisture Removal
	cents	
Wheat	2 - 50	17.6
Barley	3 - 45	19.2
Sunflower (per cwt.)	3 - 100	15.8

Source: North Dakota Crop and Livestock Reporting Service, **Custom Farm Rates, 1977**, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Fargo, January, 1978, p. 5.

A comparison of commercial rates with on-farm costs indicates that commercial drying costs are lower than on-farm average drying costs for many drying situations. A farmer who currently owns a dryer should compare only the operating costs of his system with commercial costs. However, a farmer who is contemplating a dryer purchase must also consider ownership costs. Such a comparison may favor commercial drying if required annual drying volumes are small.

Other factors may offset any cost advantage apparent for commercial crop drying. Marketing advantages of on-farm storage must be considered because crop prices are traditionally lower during the harvest season. Thus, immediate sale after drying could result in taking a lower market price for the crop. Commercial storage increases marketing flexibility but is quite costly, especially when on-farm storage is available.

Another consideration that may favor on-farm crop drying over commercial drying is the time spent waiting in line at the elevator. It is this factor that discourages many farmers from using such facilities due to inadequate drying and receiving capacity at the elevator. A 1977 survey of dryer owners revealed that the primary reason that commercial facilities were not used was because the time spent waiting in line could not be sacrificed during the harvest season. This indicates that North Dakota farmers place a high value on harvest timeliness and are willing to invest in equipment that will enable them to better use the available time.