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Corn Drying and Shrink Comparison

orn producers are faced with a variety of choices when it comes to marketing their crop. In addition to selecting a location and date, they also have several options related to the moisture level at which they deliver their grain.

If the producer has limited storage or drying capacity, selling grain directly from the field at a moisture level above that needed to achieve number 2 quality grade is convenient. The elevator or processor will accept the grain, weigh it, convert it to a certain quantity of "wet" bushels, and then dry it to an acceptable level of moisture. The net amount of revenue paid to the producer can be calculated by applying a moisture discount factor to the selling price, or by drying the grain first and adjusting the volume for shrink.

Moisture Discount

Under the moisture discount approach the total pounds of corn delivered is first divided by 56 pounds to calculate the number of "wet" bushels. A moisture discount equal to a certain percentage of the current number 2 selling price is then assessed against each wet bushel. This discount reflects both the cost of actually drying the grain to a number 2 moisture level or below and the loss of weight that will occur in the drying process. Weight loss is primarily due to the water loss during the drying process, but it also includes an estimated loss of dry matter due to the escape of some volatile compounds, kernel breakage and respiration of the seed itself. This dry matter loss is also called "handling loss." The assumed percent handling loss will vary from buyer to buyer. Research at Iowa State University found actual handling losses from .064 percent to 1.33 percent at commercial drying facilities, and from 0.22 percent to 1.71 percent at farm-based facilities (Elmore and Abendroth).



Let's assume a grower delivers 56,000 pounds of corn to an elevator, which tests at 20.5 percent average moisture. Dividing by 56 pounds per bushel gives a total of 1,000 wet bushels. Now assume that the current number 2 price is \$5.00 per bushel, and the elevator is assessing a moisture discount of 2.0 percent for each point of moisture above 15 percent, the standard for number 2 corn. Because the corn is 5.5 points above the maximum, the moisture discount is equal to 5.5 points x 2.0 percent per point, or 11 percent. The value of the discount is 11 percent times the \$5.00 per bushel selling price, or \$.55 per wet bushel. The discounted price of \$4.45 is paid on the 1,000 wet bushels, for a net revenue of \$4,450.

Using the moisture discount approach, the discount is applied to the selling price rather than the bushels of wet corn delivered, even though much of the loss is actually due to the fact that the volume of number 2 bushels of corn delivered is less than the volume of wet bushels delivered.

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Drying Cost and Shrink Factor

Another approach is to charge the producer the direct cost of drying the corn to an acceptable moisture level, then assess a shrink factor to adjust the volume of wet bushels for the water loss and assumed handling loss. This allows the buyer to easily adjust the drying charge based on the actual cost of fuel and electricity each year.

Using the same example, assume that the elevator is currently charging a drying fee of \$.048 per wet bushel per point of moisture removed. For the 1,000 bushels of 20.5 percent moisture corn the drying charge would be 5.5 points x \$.048 per point x 1,000 bushels = \$264. The seller would be charged this amount directly or have it deducted from the gross sales amount.

In addition, assume a shrink factor of 1.4 percent of the volume of grain is assessed for each point of extra moisture. In the example, this would be 5.5 points x 1.4 percent x 1,000 bushels = 77 bushels, leaving 923 bushels of dry grain. The seller will now get paid \$5.00 per bushel for the dry bushels, or \$4,615. Subtracting the drying charge of \$264 leaves a net payment of \$4,351, slightly less than under the moisture discount method. However, which method provides the highest net revenue will depend on the particular discount and drying cost factors being used at any given time.

On-farm Drying

Many corn producers have the capacity to dry their grain themselves. This allows them the flexibility to store the grain in their own facilities and to avoid possible bottlenecks when delivering grain at harvest time. However, drying grain on the farm may require extra transportation compared to delivering directly to the buyer, and the producer's drying system may not be as efficient as a large capacity system owned by an elevator.

The cost of on-farm drying depends on the type of drying system used, the amount of moisture to be removed, the current air temperature and relative humidity, and the current price of drying fuel and electricity. When choosing between drying corn on the farm and then delivering it to the elevator or delivering wet corn, only the variable costs for drying need to be considered. Ownership costs such as depreciation, interest and insurance will be the same regardless. Variable costs include items such as repairs and maintenance, labor and the cost of handling the grain in and out of the dryer. However, the major costs will be for drying fuel and electricity. Which of these is larger will depend on the type of system being used. *AgDM File A2-31*, **Estimating the Cost for Drying Corn**, provides more information about estimating drying costs for a particular system and energy price level.

Assume that the producer in the example has variable costs for drying corn of \$.045 per bushel for each point of moisture removed. If 5.5 points of moisture are removed, the cost will be 5.5×0.045 = \$.2475 per bushel, or \$247.50 for 1,000 bushels. In addition, the dry corn will weigh less so there will be fewer bushels. A load of 20.5 percent moisture corn weighing 56,000 pounds will consist of 11,480 pounds of water and 44,520 pounds of dry matter. After being dried to 15 percent moisture it will still have 44,520 pounds of dry matter, but its total weight will be only 44,520 / (1.00 - .15) = 52,376 pounds. The producer may also incur some dry matter loss (handling loss) in the drying process. Hicks and Cloud measured on-farm drying losses from 0.22 percent to 1.71 percent in their research. Assuming a dry matter loss equal to 1 percent of the wet bushel weight results in 560 fewer pounds of dry corn, leaving 51,816 pounds. At 56 pounds per bushel, the dry volume is now 51,816 / 56 = 925 bushels of number 2 corn. The elevator will pay the producer the full \$5.00 for each dry bushel, or \$5.00 x 925 bu. = \$4,625 for the load of corn. Deducting the on-farm drying costs of \$247.50 leaves net revenue of \$4,377.50.

Note that extra costs may be incurred if the grain is dried below 15 percent moisture, which may be necessary if it is to be stored for a period of time. The extra costs of additional drying include, not only the variable costs of drying, but the shrink loss from removing additional water. More detailed information about calculating shrink can be found in the National Corn Handbook fact sheet NCH-61.

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Field Drying

Many corn producers prefer to let their crop dry naturally in the field before harvesting. This reduces the cost of artificially drying the crop, but may delay harvesting and result in additional field losses due to drier stalks and ears. Producers must weigh these potential costs against potential drying charges and/or discounts. Elmore and Abendroth estimated that unharvested corn could dry at a rate of from 0.3 points of moisture per day in wet, cool weather to 1.0 points per day in hot, dry weather. The American Society of Agricultural and Biological Engineers suggests a yield loss of 0.3% may occur for each day of harvesting delay. Harvest losses will also vary with the particular hybrid planted. Even after corn has dried in the field, producers will still have to choose among the options discussed above for their final sale. However, the more moisture that is removed by drying in the field, the less impact artificial drying costs and moisture discounts will have on the net revenue received.

AgDM Decision Tool A2-32, Grain Drying and Shrink Comparison, is available to help compare the three options described above. In addition, it can help predict moisture level and harvesting losses at harvest based on expected wet bushel yields and weather conditions.

References

American Society of Agricultural and Biological Engineers Standards, Section D497.2, 8.7.

Elmore, Roger, and Lori Abendroth. "In-field Drydown Rates and Harvest." www.extension.iastate.edu/CropNews/2010/0928elmoreabendroth.htm

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