



Grain Drydown and Timely Harvest Decisions

Key Points

- Farmers and some researchers believe that it is possible to lose grain dry matter during drydown after corn reaches physiological maturity.
- The ideal harvest moisture content is between 22 and 25 percent.
- Harvest timing should be determined in each field by monitoring grain moisture, stalk quality, and ear quality.

What is the ideal harvest moisture content for grain? This question has been studied and debated by agronomists and growers over the years. Some on-farm anecdotes and limited research have suggested that yield may “disappear” after physiological maturity (black layer) due to respiring grain in the field (also known as “phantom” yield loss). This raises the question of whether it is better to harvest corn at higher grain moisture content and incur the drying cost to avoid potential yield losses or leave corn standing in the field to dry down naturally, potentially risking harvest losses.

The ideal harvest moisture content for corn is between 22 to 25 percent. Corn drydown is linked to growing degree units (GDUs). Under ideal weather conditions, corn may lose up to one point of moisture per day. As the days get cooler, GDUs decrease and grain drying slows. As a rule of thumb, 30 GDUs per moisture content point are required to lower the grain moisture content from 30 percent to 25 percent and 45 GDUs per point are required from 25 to 20 percent.¹ That means that late maturing fields may take two to three times longer to dry in the field. Research from Ohio State University indicated no additional in-field grain drydown occurred after early- to mid-November.

Phantom yield loss has been attributed to seed respiration and specific corn products.² Corn respiration rates are greatest when grain moisture is near 50 percent and decreases as grain dries. Higher temperatures and mechanical damage increases

kernel dry matter loss. Good quality corn grain may take 25 to 50 days for a one percent loss in dry matter, due to respiration, under normal fall weather conditions.² This estimate would not support the one percent dry matter loss for each percentage point of grain moisture lost after black layer.

Research Results

Corn dry matter may decrease by as much as 0.6 to 1.6 percent for each percent point loss in grain moisture content after black layer.² Research conducted by Purdue University from 1991 to 1994 identified the decrease in kernel dry weight during drydown using three corn products grown in Indiana. Kernel dry matter was measured twice weekly from the time kernels were 40 percent moisture content until moistures were less than 20 percent. The average percent loss in kernel dry matter ranged from 0.9 to 1.3 percent for the three corn products tested. Kernel dry matter loss, averaged across corn products for each year, ranged from zero to 1.2 percent loss per point of kernel moisture lost (Table 1).

In contrast to the Purdue results, University of Nebraska researchers, conducting a two-year study in south-central Nebraska, found that corn grain dry matter was stable after black layer across multiple corn products. Average grain yields for six corn products were similar over the eight harvest dates each year. This study differed from the Purdue study because machine harvest losses were accounted for and incorporated into the yield data (Table 2). Kernel weights differed between corn products but within each product kernel weight was constant. From these

Table 1. Kernel dry weight loss during field drydown averaged across corn products.

	Physiological maturity		Kernel dry weight loss per point decrease in % grain moisture content	
	1,000 kernel dry weight (g)	% moisture at maturity	Grams/1,000 kernels	% dry weight loss
1991	297.0	29.8	3.2	1.1
1992	303.7	32.5	3.5	1.2
1993	305.4	25.8	0	0
1994	360.2	25.3	3.4	0.9
Average	316.6	28.4	3.4	0.9

Source: Nielsen, R.L. Kernel dry weight loss during post-maturity drydown intervals in corn. Purdue University.

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findings, researchers concluded that there was no evidence of kernel dry matter loss after black layer.³

The Nebraska researchers explained differences between their study and the Purdue findings were due to different methods of determining grain moisture and that harvest losses were not accounted for in the final Purdue yield data.² Grain moisture was estimated with an electronic moisture meter (Purdue) which can be less accurate at moisture contents above 25 percent compared to an oven-dry method.² Ultimately, both studies reinforce the guideline that optimum grain moisture content for harvest is around 25 percent.

Harvest Determination and Losses

Harvest timing should be determined in each field by monitoring stalk quality, grain moisture content, and ear quality. These factors should take precedence over concerns about potential kernel dry matter loss after maturity to avoid potential yield losses.

When corn moisture content is approximately 23 to 25 percent, kernels shell easily and stalks generally stand better, which can make harvesting more efficient. A normal level of harvest loss is about 1 to 2 percent with a timely and efficient harvest.

Waiting for corn grain to dry to 18 percent moisture content in the field can certainly save on the energy bill, but it also increases the likelihood of excess harvest losses due to stalk lodging, ear drop, and detrimental weather, all of which can affect your bottom line. If stalk lodging or ear drop problems are observed, harvest timing will be more critical to maximize yield potential. Take the time to watch the crop condition in the field in an effort to balance field drydown with harvest losses.

Grain losses during the harvesting operation can range from 1.0 to 6.0 percent.⁴ These losses can account for more yield loss at harvest than kernel dry matter loss during drydown. Farmers have a high degree of control over harvesting losses. Identifying the sources of harvest losses and adjusting the combine are steps farmers can take to prevent excessive loss at harvest. Always refer to the manufacturer's manual before performing any maintenance.

- **Pre-harvest loss.** Losses can be higher in stressful years or when harvest is delayed. Losses due to lodging, stalk rot, dropped ears, foliar diseases, and premature plant death can occur before and during harvest.
- **Header ear loss.** Lost whole or broken ears can result from driving too fast or slow, off the row, or operating the header too high. Losses can be as high as 3 to 4 percent.
- **Header kernel loss.** Kernel loss of about 0.6 percent can occur at the gathering snouts, snapping bars, and snapping rolls.
- **Combine cylinder loss.** Some kernels can remain on the cob as they pass through the machine due to insufficient shelling action. This loss should not exceed 0.3 percent with the correct cylinder or rotor speed and correct concave clearance adjustment. Aggressive shelling action may result in excessive kernel breakage.
- **Combine separation loss.** Some kernels may pass over the sieves and out of the combine. With correct sieve and wind adjustment, this loss should be held to 0.1 percent of the total crop yield.

Sources:

¹Thomison, P. 2009. Corn harvest schedules and dry down rates. C.O.R.N. Newsletter. The Ohio State University Extension. <http://corn.osu.edu>. ²Nielsen, R. L. Kernel dry weight loss during post-maturity drydown intervals in corn. Purdue University, www.agry.purdue.edu. ³Elmore, R.W. and Roeth, F.W. 2000. Corn grain yield and kernel weight stability after black layer. University of Nebraska G1398. ⁴Hanna, M. 2008. Profitable corn harvesting PM 574. Iowa State University. Elmore, R.W. 2011. Does corn lose dry matter after physiological maturity? No. Iowa State University Integrated Crop Management newsletter. Web sources verified 08/01/2014.

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Table 2. 1997 machine harvested corn yields and moisture content averaged across six corn products in Nebraska.

Harvest Date	% Grain Moisture	Grain Yield (not adjusted for harvest losses)	Grain Yield (adjusted for harvest losses)
Sep. 29	26.6	162	174
Oct. 2	22.7	154	169
Oct. 6	18.8	155	164
Oct. 9	16.5	159	168
Oct. 14	16.1	157	165
Oct. 17	14.4	158	168
Oct. 23	15.0	167	185
Nov. 12	14.2	136	168
LSD	0.7	11	NS

Source: Elmore, R.W. and Roeth, F.W. 1999. Corn kernel weight and grain yield stability during post-maturity drydown. J. Prod. Agric. 12: 300-305.