HOW TO SELECT THE RIGHT MATURITY CORN HYBRID FOR THE CUSTOMER

Joe Lauer [1]

Introduction

Successful corn production requires the selection of the correct hybrids for the production environment. Farmers need to consider yield potential, maturity, pest resistance, and harvestability when selecting hybrids. Proper maturity is important so that the amount of drying necessary after harvest is minimized. High-yielding hybrids whose maturities take full advantage of the available growing season are generally the most energy-efficient choices (Eckert et al., 1987). A hybrid which matures far in advance of anticipated harvest does not make full use of available solar radiation, and therefore does not realize the full yield potential of the growing season and the energy related inputs provided by the farmer. Conversely, a hybrid that is not mature at the time of frost can increase artificial drying costs, in addition to not achieving full yield potential because it was killed before grain filling was complete.

Field drying of corn is a little understood process that greatly influences production costs. Drying corn after harvest is expensive. Assuming LP gas costs $0.70 per gallon and electricity costs $0.05 per kilowatt hour, drying corn from 35 percent harvest moisture to 15 percent requires about 0.472 gallons LP gas per bushel and 0.066 kwh per bushel for a total cost of $0.334 per bushel (Eckert et al., 1987). Harvesting grain at 20 and 25 percent moisture is often cited as a reasonable compromise between drying costs and harvest loss (Olson and Sander, 1988). Drying corn from 20 to 25 percent harvest moisture to 15 percent requires 0.109 to 0.219 gallon of LP gas per bushel and 0.017 to 0.033 kwh per bushel for a total cost of $0.077 to $0.155 per bushel. If 350 million bushels of corn in Wisconsin were harvested between 20 and 25 percent moisture, drying costs would range between $27 to $54 million. A more likely scenario is one-third of the corn at 20 to 25 percent moisture, one-third at 25 to 30 percent moisture, and one-third at 30 to 35 percent moisture. Drying costs for Wisconsin producers under this scenario range between $55 and $85 million.

These costs do not consider yield and quality losses due to hybrids that do not take advantage of the available growing season. In addition, if the moisture content of corn taken to market is more than 15.5 percent (the maximum for No. 2 corn), then the price paid for that corn will be adjusted downward by the prevailing moisture discount, which is usually around 2 percent of market price for each point above 15.5 percent.

Producers need to choose high-yielding hybrids that are dry as practical at harvest. Many shorter-season hybrids approach yields of full-season hybrids and may be several points lower in grain moisture at harvest. Some hybrids dry down more rapidly after maturity (black layer) than others of similar maturity due to loose husks, small cobs and/or thin seed coats.

No standard relative maturity method exists in the corn industry. Since 1929, corn hybrids to be sold in Minnesota were rated for maturity. The law was repealed in 2003 and will be retired in 2006. Little data exists for corn relative maturity recommendations in Wisconsin. The objective of this paper is to describe the optimum relative maturity for corn at various locations in Wisconsin. The paper will also provide guidelines for making corn hybrid maturity recommendations.

[1] Professor, Corn Extension Agronomist, Department of Agronomy, University of Wisconsin, 1575 Linden Drive - Agronomy, Madison, WI 53706.

Materials and Methods

Every hybrid tested in the UW hybrid evaluation program is compared against all other hybrids of the same maturity. Relative maturity is determined by comparing grain moisture of hybrids at harvest. Corn is mature when kernels reach maximum dry weight. Optimum relative maturity depends upon the harvest, use and storage methods on each farm. Corn for silage is ready as early as 10 days prior to maximum kernel dry weight, while corn picked for grain is not ready until grain moisture content reaches 23 to 28%.

Beginning in 1995, trials were conducted at Arlington, Chippewa Falls, Fond du Lac, Hancock, Janesville, Lancaster, Marshfield, Seymour and Valders. Each trial consists of two or more hybrids for each 5-day relative maturity increment from 80- to 115-days for a total of 14 to 16 hybrids per trial. The hybrids are top-performing hybrids selected from the UW corn evaluation program. These hybrids change every year as well as the locations of the trial. Yield, moisture and test weight were used to calculate the economics of the relative maturity decision.

Grower return was calculated by multiplying commodity price with yield and subtracting production costs. Corn prices used were $2.00, $2.50, and $3.00 corn. The PEPS corn price is more of a "real world" price annually determined using a marketing strategy where 50% of the crop was sold in November and 25% forward contracted (less basis) to March and July. The November average cash price was derived from Wisconsin Ag Statistics, and the March and July future prices were derived from the Chicago Board of Trade closing price on December 1 every year.

Harvesting costs were estimated for handling ($0.02 per bushel), hauling ($0.04 per bushel), trucking ($0.11 per bushel) and storage ($0.02 per bushel month with 25% of grain shipped in March after 4 months storage and 25% of grain shipped in July after 8 months storage). For the livestock system, no trucking cost is assessed and storage was $0.01 per bushel month. Drying costs were estimated at $0.00, $0.02 and $0.04 per point above 15.5% moisture per bushel for on-farm and commercial corn production systems.

Results and Discussion

Longer-season hybrids have greater potential for higher yields at most locations. In southern Wisconsin, as relative maturity increases, grain yield increases 2.2 bu/A (data not shown). At a corn price of $2.50 and drying cost of $0.02 per point moisture bushel, grower return increases $4.00 /A for each relative maturity unit. For example, at Arlington grain yield increases to a maximum around 106-days relative maturity (Figure 1a). Optimum relative maturity of corn at various locations is shown in (Table 1). At most locations, a significant relationship exists between grain yield and relative maturity. However, at Marshfield and Valders, no relationship between grain yield and relative maturity exists over multiple years of testing (Table 1).

The optimum relative maturity for grower return depends upon the corn drying method and cost (Table 2). The relative maturity that optimizes grower return is different from the relative maturity that optimizes grain yield when drying costs are considered. For example, at Arlington using an on-farm drying method, grower return is greatest with a corn hybrid relative maturity of 101-days relative maturity (Figure 1b and Table 2). At Marshfield, a 93-day hybrid optimizes grower return. Table 2 describes optimum relative maturity for various production system, drying cost, and grain price scenarios.

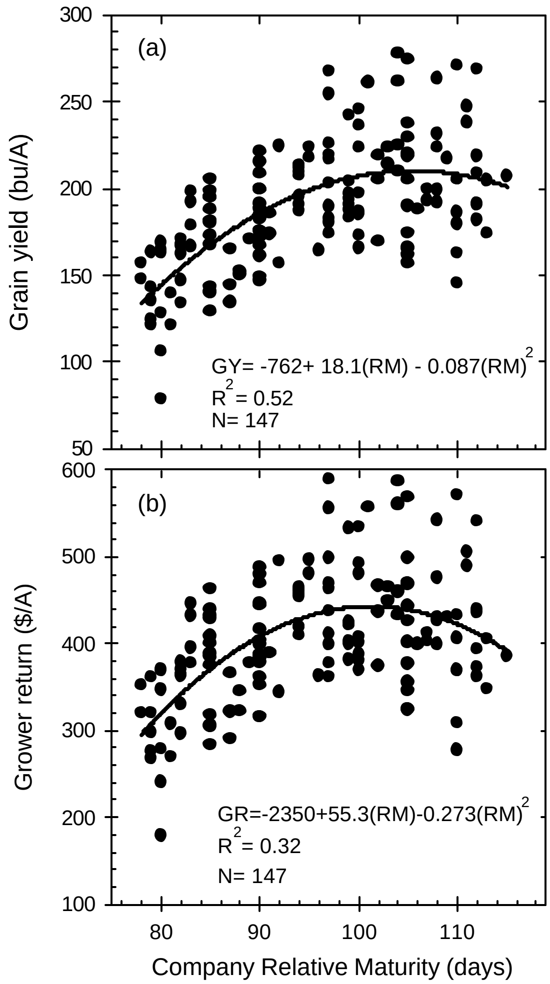

Figure 1. The relationship of relative maturity with a) grain yield and b) grower return ($2.50 corn price, on-farm drying) at Arlington, WI (1995-2004).

Table 1. Optimum relative maturity (days) for grain yield at various locations in WI.

Location	Years tested	Optimum relative maturity
Arlington	1995-2004	106
Janesville	1996-1997	107
Lancaster	1996-1997	112
Fond du Lac	1996-1997	103
Hancock	1995-2004	104
Chippewa Falls	1999-2001	104
Marshfield	1999-2004	---
Seymour	1999-2001	102
Valders	1999-2001	---

Table 2. Optimum relative maturity (days) for three corn production systems.

System:Drying Cost ($ / point bu)	Grain price ($/bu) $2.00	$2.50	$3.00	PEPS
Arlington, WI				
Commercial:$0.04	--	98	99	98
On-Farm:$0.02	100	101	102	101
Livestock:$0.00	106	106	106	107
Janesville, WI				
Commercial:$0.04	104	105	105	105
On-Farm:$0.02	106	106	106	106
Livestock:$0.00	107	107	107	108
Lancaster, WI				
Commercial:$0.04	106	112	112	112
On-Farm:$0.02	112	112	112	112
Livestock:$0.00	112	112	112	112
Fond du Lac, WI				
Commercial:$0.04	--	---	99	99
On-Farm:$0.02	100	101	101	101
Livestock:$0.00	103	103	103	103
Hancock, WI				
Commercial:$0.04	--	--	98	--
On-Farm:$0.02	100	100	101	100
Livestock:$0.00	104	104	104	103
Chippewa Falls, WI				
Commercial:$0.04	--	--	97	--
On-Farm:$0.02	98	99	100	98
Livestock:$0.00	104	104	104	104
Marshfield, WI				
Commercial:$0.04	89	90	91	89
On-Farm:$0.02	92	93	93	92
Livestock:$0.00	--	--	--	--
Seymour, WI				
Commercial:$0.04	--	--	97	--
On-Farm:$0.02	98	99	99	98
Livestock:$0.00	102	102	102	101
Valders, WI				
Commercial:$0.04	--	--	--	--
On-Farm:$0.02	--	--	--	--
Livestock:$0.00	--	--	--	--

Although farmers generally get greatest yields by planting full-season hybrids early, many short-season hybrids produce yields competitive with the best full-season hybrids and are drier at harvest (Figures 1a and 1b).

Farmers need to consider the economic tradeoff between yielding ability and drying costs for hybrid maturity. Full-season hybrids provide the greatest potential for maximizing yield and profitability. Plant several hybrid maturities each year to spread the harvest season and reduce the risk of losses from moisture stress at pollination time or early frost.

Traditionally, the mix of hybrid maturities grown on a farm vary according to the risk one is willing to assume (i.e. 25% of acres grown to full-season, 50% to mid-season, and 25% to short-season maturities). Others recommend mixing hybrid maturities according to the type of environment predicted. The best approach may be to select hybrid maturities based solely on the intended use and drying method in the production system.

To ensure genetic diversity on your farm, select corn hybrids differing for relative maturity. Optimum relative maturity is variable in Wisconsin and depends upon many factors including location, soil, management, corn price, drying method and hybrid traits. Your decision to select hybrid maturity for your farm depends upon:

1. *Desire to accept risk:* Longer season hybrids offer the highest yield potentials, but may also increase drying costs and/or delay harvest.
2. *Potential use:* For dry grain, relative maturities should be shorter-season within the maturity range for the latest acceptable planting date. For high moisture corn and silage, relative maturities should be longer-season within the maturity range for the latest acceptable planting date.
3. *Field conditions:* Shorter season hybrids within the maturity range for the latest acceptable planting date should be selected when field conditions include heavy crop residue, reduced tillage, and heavy soil textures.
4. *Hybrid dry down and grain quality characteristics:* Longer-season hybrids within the latest acceptable planting dates should have fast grain dry-down and high test weight characteristics.

Literature Cited

Eckert, D. J., R. B. Hunter, and H. M. Keener. 1987. Hybrid maturity-energy relationships in corn drying. National Corn Handbook NCH-51:

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