IOWA STATE UNIVERSITY
Extension and Outreach

Integrated Crop Management

Crop Quality Management for Harvest 2017

December 6, 2017

Corn and soybean yields in 2017 were better than expected, which will add to the largest grain surpluses in recent years. As of the November 9, 2017 USDA crop production estimates, national corn yield estimates exceeded 2016 production and were closer to 2016 production in Iowa than preharvest expectations. Soybean yields are estimated to be lower than in the record year of 2016, but total US supply will be larger due to acreage increases.

Yield (bu/a)	**2016**
	2017
Production (billion bu.)	**2016**
	2017
USA	
Yield (bu/a)	174.6
	175.4
Production (billion bu.)	15.14
	14.58
IOWA	
Yield (bu/a)	203.0

	197.0
Production (billion bu.)	2.74
	2.54

Yield (bu/a)	**2016**
	2017
Production (billion bu.)	**2016**
	2017
USA	
Yield (bu/a)	52.1
	49.5
Production (billion bu.)	4.31
	4.43
IOWA	
Yield (bu/a)	60.5
	56.0
Production (billion bu.)	0.57
	0.56

As of September 1, 2017, there were an estimated 2.3 billion bushels of corn in storage (0.5 billion bushels in Iowa) and 301 million bushels of soybeans in storage (53 million bushels in Iowa). Approximately 30% of the combined carryover was held on farms, and 70% in commercial facilities. By grain, 34% of corn and 29% of soybeans were held on farms.

The estimated grain storage balance (corn and soybeans, in billion bushels) for Iowa going into harvest in 2016 and 2017 was:

Production	
2016	3.15
2017	3.10*
On Hand (9/01)	
2016	0.46
2017	0.56
Total	
2016	3.61
2017	3.68
2016	
2017	
Storage Capacity	
2.90	
3.00**	
Balance	
0.71	
0.68	

*corn + soybeans
**USDA estimate, previous December

Gradual increase

This balance continued the gradual increase of grain on hand going into harvest. Approximately 700 million bushels, primarily corn, did not have a long term storage home, and therefore had to be placed in temporary storages, such as outdoor uncovered piles or plastic bags. Iowa corn usage is 200-240 million bushels per month, which means the temporary storage should be emptied by January or February at the latest. US regions to the north and west that are converting small grain acres (such as wheat or barley) to corn have higher amounts of grain in outdoor storage than do Corn Belt states. The significance of the gradual growth in short term storage is that corn in these storages will use its shelf life faster than corn in well managed aerated and covered storage. Yet more and more of each years' crop is being carried over, requiring storage times longer than a year. USDA is projecting an increase of 200 million bushels (to 2.49 billion bu.) in corn carryover at the end of the 2017 marketing year.

Weather

The 2017 growing season was characterized by significant swings in weather patterns, from very wet in the spring to very dry in June and July to moderate and wet in the latter part of the growing season. For a time, it appeared that the weather in the middle of season would both inhibit pollination and create moisture stresses for crop development. The US Drought Monitor reached the severe level in early August across much of the major growing area in the Western Corn Belt, and the extreme level in a four county area of South Central Iowa. Dry conditions peaked around August 5-10. The abrupt change of weather patterns in mid August, to moderate temperatures and wet, extended the growing season. This improved the fill and quality of both corn and soybeans. With extended growth, harvest moistures were higher and field drydown was slower than expected as of mid August. Grain quality was quite good; quality is normally determined by conditions at the end of the growing season.

Variety trials

We have been following public variety trials in selected Iowa locations for the past 9 years.

Corn quality and yield data from widely corn hybrids in strip trials across Iowa.

Yields were near the highs of 2016, and test weights were excellent. Moisture was somewhat above average. Composition was good as indicated by above average protein content. Higher yields typically have reduced protein, density and test weight; that trend was not the case this year, likely because of favorable grain filling weather. Kernel filling, as measured by dry weight per kernel, was 5%-10% above normal, which accounts for the

season-long underestimation of yields. Preharvest yield estimates use 5-year average weights per kernel.

Corn from the 2017 crop will be above the long-term average in feed value, and probably will have slightly lower ethanol yield per bushel. The high test weight will create good storability. It will be good corn to use for rotating the stock of 2016 crop that is still in storage.

Soybean quality and yield data from widely grown soybean varieties in strip trials across Iowa.

Yields were not as high as in the previous 3 years. The processing value, as measured by the total of protein and oil, was somewhat below average. Processors should be able to make soybean meal that is close to 47-48% protein, although meal quantities per bushel will be down. On a nationwide basis, we are seeing larger than normal variations in soybean protein and oil from north (lower) to south (higher). These will affect processor economics through meal and oil yields. Seed size is smaller that it would have been without the dry June and July. There was late growth of weeds, because rows did not fully cover in many cases. Expect foreign material levels to be higher than the normal 0.5 – 1.0%.

Storage

The high test weights and very good kernel fill should reduce grain storage problems. This is fortunate since long term storage is very likely with present surpluses. The long run of low humidity conditions in late October, early November created low dewpoints and good grain cooling opportunities. Any grain in aerated storage should be at 35 F or below. Unaerated temporary (pile) storage is still at temperature risk depending on the grain temperature going into the pile. Piles filled from trucks as they came from the field will have more varying temperature and moisture conditions throughout the pile; aeration is the only way to even that out.

If grain is uniformly cool below 35F, it is not necessary to run fans steadily. In fact, excessive aeration creates weight shrink if the grain dries below the market standard moisture level (typically 15% for corn and 13% for soybeans). At today's low prices and thin margins, losses from excess energy cost and unnecessary shrink can be significant. Removal by aeration of 1% extra moisture in corn will cost about four cents per bu in weight loss and about two cents per bu in energy cost. For soybeans, the cost would be about 12 cents per bu for the weight and two cents per bu for the energy.

The key to grain management is effective and consistent temperature monitoring. For bin sizes over 20,000 bu, this means some form of electronic temperature system. Manual monitoring is progressively less accurate as bin size goes up. An increase of three degrees F in two weeks, if the fans have not been run in the period, indicates spoilage somewhere in the bin.

Grain that is spoiling gives off carbon dioxide (CO_2). Relatively inexpensive CO_2 monitors can be used to track changes in CO_2 levels, either at fan exhaust or in headspaces. Increase in CO_2 (over a baseline established when the bin is filled) is actually a more sensitive indicator of spoilage than is a rise in temperature. Neither one will pinpoint the location of the trouble in the bin, although temperature sensing cables, common at elevators, will give more hotspot location information than will a general rise in CO_2 levels.

The significant amount of carryover grain created situations where 2016 and 2017 grain could be mixed in the same bin. Mixing of old grain that has partially used its storage life with new grain that is not yet stable is likely to create storage problems. The best plan is to either rotate the new for the old, or combine lots of old crop so that the new crop can start an empty bin. Either of these creates extra work at harvest, but that work will pay back if the grain is stored into the next summer or longer. Any crop year mixtures should be the first grain out with fresh sales.

Finally, the shelf life of the grain (below) needs to be respected especially in conditions of long term storage. The storage time is progressively used at the various storage conditions through the year. If wet corn is held before drying, significant percentages of the storage time can be consumed, leaving less for the summer months. In 2016, for example, there were poor cooling conditions (high dewpoints). A lot of the storage life was used. There were many reports of spoilage from blue-eye mold in July and August 2017. In conditions of surplus with long term storage likely, do not waste the storage life in the fall; it cannot be recovered.

Maximum storage time (months); corn and soybeans*							
Temperature ° F	Corn, soybeans moisture content						
	13%, 11%	14%, 12%	15%, 13%	16%, 14%	17%, 15%	18%, 16%	24% N/A
40	150	61	29.0	15.0	9.4	6.1	1.3
50	84	34	16.0	8.9	5.3	3.4	0.5
60	47	19	9.2	5.0	3.0	1.9	0.3
70	26	11	5.2	2.8	1.7	1.1	0.2
80	15	6	2.9	1.6	0.9	0.9	0.06
*Based on 0.5% maximum dry matter loss—calculated on the basis of USDA research at Iowa State University. Corresponds to one grade number loss; 2-3% pts of Total Damaged seeds							

Category: Grain Handling and Storage

Crops:

Corn Soybean

Tags: grain quality grain storage

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