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The role of production agronomists and crop advisors in the Food Safety Modernization Act

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Abstract

While the unexpectedly favorable weather after Labor Day removed most of the potential for crop quality issues, the newly released Food Safety Modernization Act Human Food and Animal Food Preventive Control Rules will have ongoing impact on the grain supply chain from farm to user. Requests by grain users (feed mills, ethanol plants, corn wet mills, and others) for verification of hazard control are likely to become common. Farms and elevators will become a source of risk in users' required hazard analysis. Most hazards in bulk grain originate in production (mycotoxins, diseases) which will make advance forecasting and monitoring by trained professionals an important element of risk control documentation. Mycotoxin management is an example of the supply chain preventive control that will be needed.

Current crop quality situation

A preharvest cool and wet long range forecast meant that large volumes of wet grains could be coming out of the field, at highly variable quality. That did not happen. Warm temperatures and low dewpoints (dry air) since Labor Day have completely changed the crop quality picture. While there were still instances of wet grain and delayed harvest from early September rains, overall the Iowa corn and soybean crops had a marked reversal from what we anticipated.

The rapid field drydown driven by low humidity air also increased corn test weights, a key measure of future storability. Much of 2015 corn will have to be stored a year or more.

The emphasis became long term storage preparation. The most important action right at harvest is to reduce the temperatures as much as possible. Dewpoints were low in October, in the 30s and 40s, allowed aeration to take grain temperatures down quickly. Holding wet grain without aeration will use much of the storage life very quickly.

Figure 1. September 2015 temperatures and dewpoints for Ames, Iowa.

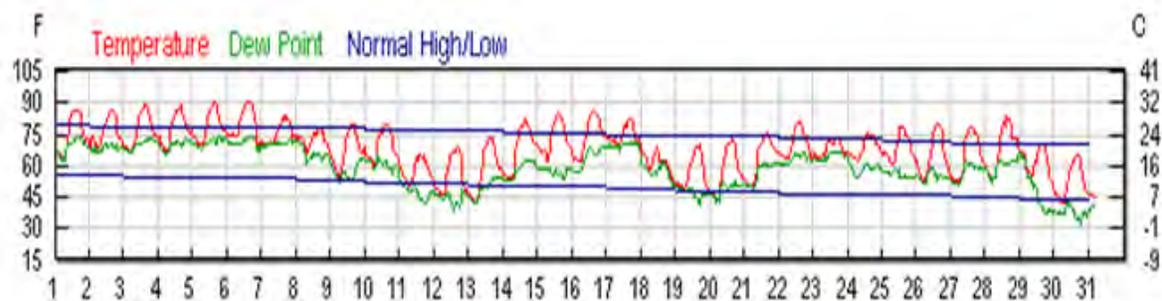
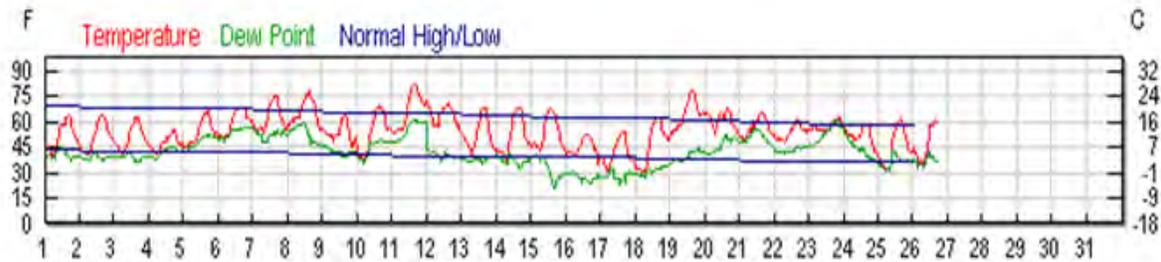


Figure 2. October, 2015 temperatures and dewpoints for Ames, Iowa. Source: <http://www.wunderground.com/history/airport/KAMW/2015/10/1/MonthlyHistory.html>



The large differences between the temperature and the dewpoint in mid-October were the main factors in bringing harvest moisture down. Large differences mean low humidity and strong evaporative cooling of aerated grain.

Diseases and the very tall stalks created by this year's growing season created trashier corn than normal. Tall and fragile stalks put large amounts of plant material through the combine. Trash in this case is likely to be cobs and plant pieces rather than fines from broken corn. Because typical grain cleaners in farm handling systems are designed to remove more fines than cobs, leaves, and stalk parts, elevators and users will likely have to remove these materials.

Grain handling emphasis is now on protecting the storage life of what has turned out to be a much more storable crop than expected before harvest.

From a composition viewpoint, the 2015 corn crop will be low in protein (~6.5% vs. average 7.5%) and correspondingly higher in starch. Ethanol yields in gal/bu will be high. The 2015 soybean crop will also be below average in protein (~34% vs. average 35%) but above average in oil (~19.5% vs average 18.5%). Some processing plants may have difficulty making 47.5% high protein meal.

Food Safety Modernization Act

The Food Safety Modernization Act was passed in 2011, but the majority of the rules to implement FSMA are being finalized in 2015, with actual implementation dates in 2016 and beyond. FSMA will create 50 new rules intended to cover prevention of foodborne hazards, implementation and compliance, imported food issues, and increase collaboration among jurisdictions responsible for food safety. From a grain production and processing perspective, the most important provisions cover:

- Documented hazard assessment, action planning and subsequent follow up (validation) of actions that will prevent known food safety hazards from entering the food and feed supply chains. The Human Food and Animal Food Rules are slightly different but generally have the same requirements.
- Documented use of Good Manufacturing Practices in key areas such as facility maintenance, sanitation and personnel training.
- Sanitation of transportation vehicles will require additional documentation of cleanliness in truck, trains, and airplanes used to carry Human and Animal Food and/or ingredients.
- Ability of FDA to require product recalls, and other diversion actions if uncontrolled hazards to either human or animal health are found.

- Food safety inspections of all registered facilities on at least a 5-7 year cycle. Grain elevators are registered facilities.

All processors, mills or other food manufacturing facilities that use grain or grain products (e.g., soybean meal, DDGS) are subject to FSMA rules. Farms are exempt from FSMA in total; grain elevators that only handle and store products are exempt from having the written hazard analysis and preventive control plan, and from documented GMPs. While exempt, neither farms nor elevators are immune to the regulatory implications of FSMA (discussed more below). Processing facilities (e.g., feed mills) that are totally vertically integrated with a farm are exempt but FDA has said that this provision will be revisited. Produce has a separate set of rules and requirements.

Some leading potential hazards for grain and grain products are:

- Mycotoxins (see below)
- Treated seed
- Metals, glass, petroleum residues, and other contaminants.
- Presence of allergenic materials in products intended for food (e.g., soybeans in wheat, or wheat in food grade corn).

This is not a comprehensive list and each user must do their own hazard analysis. Recognize that some of these originate on the farm, not in storage and handling.

There are various exemptions from FDA inspections to enforce FSMA. However, some grain users subject to FSMA rely on actions of exempt suppliers (e.g., elevators, farms) to control hazards, and list these preventive actions in their own preventive control plans. In these instances FDA can ask those suppliers for proof of action. If a recall situation occurs, then there is no limit to FDA's right to track problems back to their source, if possible, even back to exempt suppliers. Expect purchase contracts to become more detailed in terms of hazards. The market will press food safety back through the system as a means of liability protection. Therefore grain elevators, and farms, should be aware of the food safety provisions in the supply chain they are selling into.

Iowa State University will be a trainer of Qualified Individuals for both Human and Animal Food Rules. A starting point checklist is available on the Grain Quality Initiative website, www.iowagrains.org. Other materials and training is under development. For FSMA itself, the FDA has developed some excellent factsheets and other supporting materials available at <http://www.fda.gov/Food/GuidanceRegulation/FSMA/default.htm>.

Predictive management of mycotoxins

Cool, wet weather late in the season put the focus on deoxynivalenol (also known as vomitoxin or DON) and zearalenone as potential mycotoxin risks for 2015 corn. These mycotoxins tend to co-occur in grains because they can be produced by the same fungus, *Fusarium graminearum*. Reports from incoming Iowa corn have shown that these mycotoxins have been found, but only at low levels. The livestock animal most sensitive to deoxynivalenol is swine, who do not tolerate above 5 ppm in finished feed. More information on mycotoxins, their development, and management can be found in two educational modules, Mycotoxins I and Mycotoxins II, posted on the Iowa Grain Quality Initiative website, <http://www.iowagrains.org>.

The preventive control focus of new FSMA regulations imposes the need for all grain buyers and users to monitor incoming grain more regularly to comply with the requirements of end users. Mycotoxins generally originate in the field and, if grain is handled and stored correctly, mycotoxin levels will not increase in storage. This means that detection must begin with weather monitoring and field scouting in advance of harvest to determine the risk in a given production area (as the type of mycotoxin risk is highly dependent on climate and weather conditions, especially during grain fill). Crop consultants and agronomists from input suppliers will be called upon to provide early warning for grain handlers/users. Expect more connection between agronomy supply and grain marketing.

Beyond preharvest scouting, grain buyers should develop a written mycotoxin monitoring strategy that includes strategic testing of incoming grain (likely composite sample testing), documentation, and verification of accuracy. The best starting point is a daily or twice daily composite sample (of the loads received that day) submitted to the local USDA-GIPSA service point for analysis of the four key mycotoxins-aflatoxin, fumonisin, vomitoxin, and zearalenone. Charting of the results from the start of new crop harvest will indicate if there is a problem in a specific trade area. If no issue is evident after 10 days – 2weeks of new crop harvest, then the frequency can be reduced. An alternative to combining small portions from each load might be a composite of periodic of the corn dryer output testing; this would be a well-mixed blend, in situations where drying is needed for the majority of inbound corn.