**IMPACT STATEMENT**

**Advanced Management of In-Bin Drying and Storage Systems to Maintain Grain Quality and Prevent Development of Mycotoxins**

**Issue**
On-farm, in-bin drying and storage of grains using natural air, if not properly managed, is a process that is prone to grain mold contamination and associated mycotoxin contamination problems (e.g., aflatoxin), posing significant public health risks, and reducing overall grain quality. The recently-introduced technology for use in on-farm drying systems offers a means to utilize the advantages of low-temperature, in-bin drying systems, yet prevent the disadvantages that are sometimes incurred with natural air drying. The new technology controls drying fan operation by the principle of Equilibrium Moisture Content (EMC), which is the moisture content that a specific grain will attain if exposed to air with a given relative humidity and temperature for a long enough duration. Thus, drying fans are operated only under set conditions to avoid over-drying of grain. The new in-bin technology comprises sensors to measure ambient air conditions, as well as cables to monitor grain moisture content and temperature throughout the grain bin mass, and the data can also be accessed anytime via the internet, which has revolutionized monitoring capabilities. From an electronic monitor and fan control standpoint, this new technology appears very promising. However, the ultimate success hinges on (1) accurate EMC data to determine fan run time and (2) knowledge of the rate of mycotoxin development and quality reduction for rice in the upper bin layers.

**Action**
In collaboration with Arkansas grain producers and processors, our research continues to produce science-based knowledge to inform improved regional and national food security, chiefly in the rice, soybean, corn, and grain-sorghum industries, on issues of drying and storage conditions and methods that maintain grain quality and mitigate contamination with toxigenic fungi and their associated mycotoxins, many of which are carcinogenic to humans. Specific issues addressed include:

- Studying kinetics of grain quality degradation, mold growth, and mycotoxin development during on-farm, in-bin drying and storage;
- Determination of accurate EMC models for use in the new on-farm, in-bin drying and storage systems;
- Mathematical modeling to optimize performance of the on-farm, in-bin grain drying and storage systems;
- Development of novel techniques for detection, decontamination, and detoxification of harmful grain molds and mycotoxins.

**Impact**
Our latest research findings answer the following questions that are critical for successful implementation of the modern on-farm, in-bin drying and storage systems in major U.S. growing areas: (1) what is the rate of grain “quality” reduction and mycotoxin development under typically encountered drying and storage scenarios; (2) with respect to stored product “quality”, what is the upper moisture content limit for grain placed into the modern drying and storage bin systems at various geographic locations; and (3) what energy savings could be realized with these new in-bin drying and storage systems? In addition, we continue to develop novel and auxiliary heating techniques such as those using infrared and microwaves for grain drying or pre-drying, chiefly to achieve simultaneous inactivation of mycotoxin-producing mold spores and insects disinfestation.

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