ANR CAMPUS SUCCESS STORY

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Supports Plan of Work Number: 123 – Grain Quality Initiative

Title of Success Story: Aflatoxin Workshop on 2005 Aflatoxin Levels and Responses

Situation:
The aflatoxin issue of fall 2005 pointed out the need for an overall view of grain-based food
safety concerns, and that some work was needed to improve market response and grain
management in these situations. Food safety issues are very difficult to deal with in bulk
commodity marketing. They typically involve detecting trace amounts of material that is non-
uniformly distributed among individual kernels. The tolerances are generally low, in the parts
per million or parts per billion range. Sampling error is often in the 25% - 40% range, which is
particularly troublesome for a zero or very low tolerance case, in that one detect out of any
number of resamplings still triggers action.

Improved coordination of the various regulations, risk management programs, and logistical
strategies clearly would be a benefit to the entire grain market. The overall goal is to minimize
risk and/or consequences of food safety problems while simultaneously directing the affected
products to whatever use is safe for the levels present.

Objective/Action:
The aflatoxin case is an excellent model for managing other food safety or food safety perception
issues. A discussion workshop was held to review the successes and difficulties of the 2005
aflatoxin situation and to identify a set of possible action items that would mitigate future
impacts of similar situations. This workshop was intended to explore possible current actions and
coordination. It provides an opportunity to develop expertise, programs and methods around a
very real problem. This was a research presentation forum; the overall format short
presentations followed by discussion, and overall discussion/action items at the end.

- Crop Insurance indemnification, adjustment, settlement, and disposition of grain after
  settlement.
- Testing and subsequent management practices at country markets
- Management of aflatoxin corn– documentation, responsibilities
• Aflatoxin in Processing
• Export (river) markets
• Testing protocols
• Early warning – do we need a regular program?

Activities/Output:
The workshop reviewed the various operational and policy issues through presentations and identify possible actions through discussion that would mitigate these problems in future mycotoxin or other food safety situations.

Presentation Highlights:

• Dr. Charles Hurburgh: Iowa Grain Quality Initiative, Iowa State University Chairperson

• Dr. Alison Robertson: Iowa State University – Plant Pathology
  ○ Presented – aflatoxin growth and identity

• Dave Bell: USDA – RMA
  ○ Presented – sampling and crop insurance

• Garnett Wood, Ph.D. – FDA – Center for Food Safety and Applied Nutrition
  ○ Presented – aflatoxin regulatory issues

• Terry Jensen – IDALS – Feed and Fertilizer Bureau
  ○ Presented – Iowa feed position on aflatoxin

• Ned Bergman – USDA – CCC
  ○ Presented – management practices in local markets

• Richard Wahl – IDALS – Grain Warehouse
  ○ Presented – Iowa warehouse position on local markets

• Robert Lijewski – USDA – GIPSA
  ○ Presented – role in aflatoxin testing

• Joe Aull – Grain Processing Crop.
  ○ Presented – aflatoxin in corn processing

• Virgil Schmitt and Jim Jensen – Iowa State University – Area Extension
  ○ Presented – Early warning needs

Discussion Points

1. Need to be able to identify potential aflatoxin fields earlier and more quickly.
2. Inconsistency in field sampling caused varied levels of aflatoxin readings.
3. Inconsistency in sample size/sample handling caused varied levels of aflatoxin readings.
4. Inconsistency in sample treatment caused varied levels of aflatoxin readings.
5. Aflatoxin levels in fields are determined by fall weather - hot and dry as corn is drying down.
6. Aflatoxin levels in the field are caused when corn is not mature in hot dry conditions.
7. Insect damage will aggravate the problem.
9. An aflatoxin development model for northern corn belt would improve predictability.
10. Insurance loss adjuster was not always able to take a timely sample at harvest.
11. Aflatoxin increases rapidly in a short time if conditions are right so:
12. Insurance field samples taken from a field strip left after harvest may not be representative of the harvest taken earlier or:
13. Insurance samples taken before harvest may not always identify aflatoxin levels at harvest a few days later but aflatoxin then can be identified at the elevator with no risk settlement.
14. Number of samples per field required for accurate risk assessment is not well known.
15. RMA paid $6,000,000 in aflatoxin settlements in 2005.
16. Some farmers may have received undeserved payments and some may not have received payments to which they were entitled because of sampling error.
17. Farm fields identified by insurance with significant aflatoxin are not communicated to grain handlers, state agencies or the FDA.
18. Some grain was taken to the elevator which had known levels of aflatoxin without warning to the buyer.
19. Not all aflatoxin corn went to the required market source defined by FDA guidelines.
20. Corn which had stacked insect traits showed less susceptibility to significant aflatoxin levels.
21. Processors were required for internal customer and liability reasons to test every corn load.
22. Producers felt cornered with few market options once aflatoxin was determined.

**Recommendations**

1. **Develop a northern corn belt model for aflatoxin occurrence.**
   a. Does soil type affect levels of aflatoxin across fields?
   b. Does corn hybrid or physical traits affect kernel susceptibility to aflatoxin?
   c. What are the precise weather temperature variables causing aflatoxin and can a forecasting model be created?

2. **Evaluate the field sample requirements which end at harvest for a risk payment.**
   a. Sample taken at harvest, what does that mean?
   b. Do samples taken at harvest have the same level of aflatoxin as a sample taken at harvest from a strip left for risk assessment?
   c. Do sample locations in a field determine differential levels of aflatoxin; what would be the best sampling plan to reduce the variability of settlements?
   d. Can the typical 25-40% error level be reduced by consistency in sample taken, sample size, sample coarseness or other factors, number of samples, etc?

3. **Training for insurance loss adjusters responsible for risk assessment for RMA payment for aflatoxin laden corn**
   a. How does a corn plant develop
b. How does aflatoxin develop and under what conditions
c. Field sampling procedures and parameters of sampling error
d. AIPS procedures for reinsured for uniform payout

4. **Investigate a sample procedure with GPS parameters**
   a. A sample taken at harvest that is GPS defined
   b. A sample taken at harvest at each unload and marked on the GPS map
   c. A sample bag defined for each unload dump at harvest matching the GPS location
   d. GPS procedures validated by loss adjusters at harvest enhance documentation of sample

5. **Improve communication through early warning tools**
   a. A model with predictable parameters on a website
   b. A website with risk assessment tool such as a model, drought maps, corn variety factors, and other features defining risk
   c. Can field scouting practices be incorporated into early warning strategies?
   d. Can extension and other agencies work together to distribute information on risk and levels of risk of aflatoxin development for a given crop year.

6. **Improve record keeping and market listing for corn with varying aflatoxin levels**
   a. Develop a listing mechanism whereby information on corn tested and aflatoxin levels is available for elevators and processors to make business risk assessments.
   b. Develop a market list where aflatoxin corn may be disposed of according to FDA guidelines.

7. **Crop insurance coverage on stored corn for the Northern Corn Belt – producer recommendations**
   a. Allow storage coverage for that crop’s marketing year
   b. Improve overall sampling error
   c. Provide improved coverage for producers
   d. Reduce RMA costs of implementation and payouts
   e. Policy needs to improve safety in the food chain

**Impact/Outcomes:**
USDA – RMA requested a proposal under the research call that closed June 7, 2006.

**Proposal Summary**

Aflatoxin is a covered loss under multi-peril crop insurance policies. Because the toxin is often present in a few kernels out of larger lot, such as a truckload, the detection, sampling and post harvest management is highly variable. The sampling error compounds with the uneven distribution of crop stress in the field to further complicate the adjusters problem of determining a level in a given quantity of corn. Warm weather after adjustment and before harvest can increase aflatoxin levels rapidly, as can poor postharvest storage management practices. Finally, the aflatoxin corn must be held separate from the general market once the identification has been made, because aflatoxin is an adulterant under the Food Drug and Cosmetic Act. There are
markets for aflatoxin corn, following the FDA guidelines, but to this point, no concentrated effort has been made to understand the value of such corn, so that fair settlements can be made, and producers holding aflatoxin corn can be directed to reasonable markets.

The 2005 Iowa-Illinois outbreak led to an industrywide workshop on April 19, 2006, where the various aspects of the aflatoxin issue were presented and discussed. The following general areas were identified as needs for improvement:

- Advance prediction of outbreaks, since they are somewhat rare in the corn belt
- Validation of field sampling, and subsequent testing and grain management (if found)
- Assessment of product value at increasing aflatoxin levels.

This proposal is addressed to Objective 2, in the RMA request for proposals, April 24, 2006; to develop risk management tools to assist producers (including livestock) in finding alternative products, techniques or strategies related to disease management. Specific project objectives and underlying questions are:

1. Develop a forecasting model to determine the risk of aflatoxin contamination of corn in a growing season
   - Can the risk of aflatoxin contamination of corn based be predicted from environmental conditions?
   - Can we upgrade an initial model based on weather data to one based on imagery taken during the growing season overlaid with soil maps and other georeferenced data.
   - This will require in-field grain and soil sampling and a review of historical data collected by other Universities and USDA agencies. We will utilize data from adjusters to confirm model(s).

2. Design and evaluate uniform strategies for establishing aflatoxin levels in the adjustment process such as:
   - Construction and timing of field sampling plans
   - Potential for bin sampling
   - Use of subsequent commercially taken samples.
   - Traceability of aflatoxin corn once determination has been made.
   This item will be addressed with the application of a grain production traceability system evaluation recently developed from a USDA Special Grant Food Chain Economic Analysis.

3. Estimate the loss in value of corn (to users) as aflatoxin levels increase beyond 20 ppb.
   This will be determined from an extensive survey of potential user of aflatoxin corn, and of animal nutritionists/veterinarians who make recommendations to users on its use.

The RMA will have a rational basis for estimating where aflatoxin might occur in the corn belt, its extent, and potential threat to users most likely to receive this corn. RMA will be able to make more accurate valuations of loss, and assist with the correct disposal of the corn according to health-based guidelines.
**Participants**

Dr. Charles Hurburgh – ABE
Dr. Alison E Robertson – Plant Pathology
Dr. Samuel Beattie – Food Science

Howard Shepherd - IGQI
Dr. Anthony Pometto – Food Science