Title The economics of integrated pest management in stored corn

Author Yigezu Yigezu, Corinne E. Alexander, Paul V. Preckel, James M. Lowenberg-Deboer and Dirk E. Maier

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Abstract

Pests are among the major causes of postharvest loss in grain storage. Experts in storage management propose the use of a combination of preventive and monitoring-based responsive strategies to control pests. In this dissertation, stochastic dynamic programming models were used to determine the expected profitability and optimal combination, timing and intensity of integrated pest management strategies for on-farm corn storage in Indiana where the following three scenarios were considered: (1) only molds need to be controlled, (2) only insects need to be controlled, and (3) both molds and insects need to be controlled simultaneously.

We find that the monitoring-based optimal pest management strategies depend on the biophysical conditions of the grain and the time period considered. The results show that the monitoring-based optimal pest management strategy costs less than its benefits in all three scenarios.

With a few exceptions, conditionally aerating the grain, where aeration is performed when the ambient temperature is sufficiently below the in-bin temperature, is found to be the optimal strategy in all scenarios. Fumigation is not an optimal strategy unless it is absolutely necessary to avoid rejection of the grain by buyers due to the number of live insects. If the number of live insects is high enough, then farmers should fumigate at the time of grain sale.

By using conditional aeration and sales strategies only, the typical Indiana farmer can avoid fumigation and also increase profit. If farmers who have contracts to deliver high quality corn to food processors use IPM, a monthly storage payment of 4¢ per bushel ensures that the desired amount of acceptable quality grain is delivered to the food processor throughout the year.

The results also show that the optimal control strategies for multiple pests cannot be drawn from the results of single pest models. This calls for the development of appropriate models that combine both the common and unique features of the individual pests. The development of such models is even more important when there is interaction between the pests and synergies among control strategies.