PI: DeWolf, Erick **PI's E-mail: dewolf1@ksu.edu**

Project ID: FY09-PA-041 **FY08 ARS Agreement #: 59-0790-7-072**

Research Category: **MGMT** **Duration of Award: 1 Year**

Project Title: A First-Generation Model for DON Prediction in Multiple Wheat Classes in the US.

PROJECT 2 ABSTRACT

(1 Page Limit)

FHB and DON continue to be a concern in all major wheat- and barley-producing regions, and now that several fungicides are registered for managing this disease/toxin complex, risk assessment models will be of great value to producers and consultants as they make fungicide application decisions. *Objectives:* (1) Advance the development of DON prediction models through better understanding of factors influencing DON accumulation and (2) continue the development of mechanistic models for FHB/DON and refinement of empirical models. These objectives are consistent with the MGMT PD-RA priority of understanding the specific environmental and biological factors influencing FHB infection and DON accumulation in order to develop the next generation of FHB and DON risk assessment models. We will use data generated by the integrated management trials to study the relationship of weather, inoculum and disease/DON. Most of these plots represent experiments with minimum artificial intervention through irrigation, inoculation and fungicide application, and are suitable for the development of prediction models. We will also evaluate data from inoculated, non-irrigated breeding nurseries in an effort to characterize weather- and crop-related factors that influence the probability of infection and DON accumulation when inoculum is not limiting. The hourly weather data associated with each location will be edited to eliminate questionable data points and specialized spreadsheet macros will be used to construct composite input variables representing different time windows relative to the time of anthesis. The most valuable predictor variables will be identified based on data plots, regression, and correlations analyses. A combination of logistic mixed-model regression and classification-tree-based modeling approaches will be used to develop, adapt, and refine equations to estimate the probability of infection and the probability of DON exceeding critical threshold levels, given weather conditions and cultivar susceptibility. The equations produced by the logistic mixed model regression analysis will form the basis of modules within the mechanistic models developed using STELLA programming language. Several candidate models will be developed and evaluated to predict whether DON levels in the harvested grain will be above several different thresholds (1, 2, and 4 ppm) based on summaries of weather conditions prior to and during anthesis and early grain fill. The accuracy of all developed models will be calculated in term of: 1) sensitivity, true positive proportion, fraction of true high-disease or high-DON location-years correctly predicted and 2) specificity, the true negative proportion, fraction of true low-disease or low (zero)-DON location-years correctly predicted.