PI: Pierce Paul **PI's E-mail: paul.661@osu.edu**

Project ID: FY12-DE-030 **ARS Agreement #: 59-0206-9-071**

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

Project Title: Development of Prediction Models for Fusarium Head Blight.

PROJECT 3 ABSTRACT

(1 Page Limit)

The overall goal of the modeling effort is to provide accurate predictions of FHB and DON that will improve the management and reduce the impact of the disease on growers and the agricultural industry. Although considerable progress has already been made toward reaching this goal, additional improvements are possible. The specific objectives for FY12-FY13 include: (1) Coordinate the collection of new observations from the integrated management coordinated project that will be used in future model development and testing. (2) Conduct cleaning and quality assessment of new observations before including them in the dataset used in model development and validation. (3) Continue efforts to improve the prediction accuracy of models for FHB and DON by incorporating observations representing new varieties with FHB resistance, post-anthesis weather, and exploring modern approaches to model development. (4) Evaluate the potential value of prediction models as part of the integrated management program for FHB and DON using Bayesian decision theory. These objectives will be accomplished by frequent contacts with cooperators involved in the integrated management cp to facilitate the collection and standardization of the hourly weather data from the 2012 and 2013 growing seasons. The new observations will be subject to the data cleaning algorithms to address possible inconsistencies and impute any missing data. The new observations will be added to the total data sets and new variables created representing relationships with *Fusarium* biology or previous modeling efforts. Potential input variables will be selected using a "leaps and bounds" algorithm that allows subset selection based on information criteria within logistic regression models. Predictor variables describing the impact of environment on *Fusarium* biology are often highly correlated, further complicating variable selection. Several penalization methods of variable selection and parameter estimation will be explored to compensate for potential collinearity and improve the stability of model parameter estimates. Additional approaches to predictive modeling including Boosted Regression Tree (BRTs) will be explored. The BRT approach involves the development of multiple models each representing unique relationships between the predictor variables and FHB or DON. Multiple models are then combined to produce a unified prediction that is often more accurate than any single model alone. All models identified by this analysis will be further evaluated using Bayesian decision theory. The Bayesian approach helps estimate the potential impact of information provided by a disease prediction model on FHB and DON management. These additional improvements in model accuracy will enhance performance of the models as part of the integrated management of the disease/mycotoxin complex. The project addresses the second research priority of the FHB Management research area.