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Project ID: FY14-DE-018 **ARS Agreement #: 59-0206-2-087**

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

Project Title: Continued Deployment of Prediction Models for Fusarium Head Blight.

PROJECT 1 ABSTRACT

(1 Page Limit)

The disease forecasting models deployed via the Fusarium Head Blight (FHB) Prediction Center (www.wheatscab.psu.edu) help farm managers evaluate the risk of disease and the need for fungicide applications as part of the integrated management of FHB and DON. While we have already made considerable progress in model deployment, additional projects are needed to ensure the continued delivery of these decision tools, and further improve the utility, and adoption of these important tools for FHB management. Our specific objectives for FY14-FY15 include: Continued deployment of the disease prediction models in 30 states including the support of the state commentary tools, FHB Alerts and the web-page information explaining the models. 2. Continued support of the new back-up system for improved system stability. 3. Refine a version of the FHB Prediction Center for use with mobile devices (cellular-based mobile/"smart" phones and tablets). 4. Redesign of the expert tools to allow disease specialists to record and display disease observations – for refinement in the delivery of the current and experimental models. 5. Develop training modules to help state specialists learn to use the prediction tools more effectively. 6. Verify model inputs and improved capacity for site-specific predictions. 7. Implement a user survey to document value of the prediction system and its impact on stakeholders. To accomplish these objectives we propose to use the Real Time Mesoscale Analysis, provided by NOAA's National Weather Service, to produce the daily maps of disease risk at a 2.5 km spatial resolution in the 30 states. The system will also use hourly reporting weather stations maintained by the NWS, as well as independent weather networks of weather stations from Agricultural Weather Networks. The state commentary feature will be available for all states covered by the disease prediction effort. The commentaries will be displayed along with maps of the disease risk and distributed through the FHB Alert System. The current expert tools that are used for testing new models will be transitioned to a HTML5 web application powered by the GeoServer web map server software that is based on an object-relational database management system. We propose to add new features to the expert tools that will enable disease specialists to develop maps of disease levels throughout the US that can be used to verify current models and test the next generation of prediction models. We propose to organize web-based training modules that will help specialists gain experience with the prediction models. Users of the training modules will be provided with case studies illustrating different scenarios commonly experienced by users of the models and the most frequently asked questions. A user survey will be implemented to assess the value of the prediction system and its impact on stakeholders of the USWBSI.

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Project ID: FY14-DE-019 **ARS Agreement #: 59-0206-2-087**

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

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

PROJECT 2 ABSTRACT

(1 Page Limit)

The overall goal of the modeling effort is to improve the predictive accuracy of models used to manage FHB and DON, thereby reducing the impact of FHB on growers and agricultural industries relying on wheat and barley. We have already made considerable progress toward reaching this goal; however, additional improvements are possible. The specific objectives for FY14-FY15 include: (1) Coordinate the collection of new observations from the IM-CP used in developing and testing future models; (2) Conduct quality checks on the new observations before including them in the expanded dataset; (3) Improve the prediction accuracy of models for FHB and DON by (i) including predictors from time periods not considered by the current models, and (ii) by using functional data analysis to identify signal locations within the expanded time series; (4) Evaluate the potential value of prediction models as part of the integrated management program for FHB and DON using Bayesian decision theory. Frequent contact with cooperators involved in the IM-CP will facilitate the collection of data from the 2014 and 2015 growing seasons. Additional weather-based predictors not previously considered will be created, based on our own current modeling efforts as well as those suggested by recent models presented by other research groups. Functional data analysis will be used to look for differences between epidemics and non-epidemics in a predictors' time series up to several months before anthesis. A functional analysis is analogous to ANOVA, except the independent variable consists of a time series represented by a curve, rather than a point value. This approach will identify periods within the time series most strongly associated with FHB epidemics. The results of the functional analysis will be transferred to logistic regression models, which are easy to apply on a large geographical scale via the Fusarium Head Blight Prediction Center (www.wheatscab.psu.edu). All models identified by this analysis will be further evaluated for utility using Bayesian decision theory. Decision theory helps assess the impact of information provided by a disease or DON prediction model over more naive decisions (e.g. always apply a fungicide or don't apply a fungicide). Additional improvements in model accuracy will enhance their utility as part of the integrated management of the disease/mycotoxin complex. The project addresses the second research priority of the FHB Management research area.