FY09 Research Area (RA) Program Descriptions and Research Priorities (PD-RP)

FHB MANAGEMENT (MGMT)

FY09 Program Description:

The FHB Management (MGMT) research area supports research to develop effective and economical disease management practices that reduce FHB severity and DON in harvested grain to meet the immediate and long-term needs of the wheat and barley industries.

This research area involves:

- tillage practices, crop sequences, and other cultural practices targeting *Fusarium*-infested residues;
- fungicides, biological control agents, and application technologies for chemical and biological agents;
- the refinement and deployment of disease prediction and forecasting models and disease management decision tools; and
- studies of pathogen survival, inoculum production, dispersal, infection, colonization, mycotoxin production, and factors accounting for high levels of mycotoxin in asymptomatic grain.

NOTE: Priority will be given to multi-PI, collaborative, integrated pre-proposals that address the research priorities listed below. Pre-proposals pertaining to uniform integrated management (IM) studies and uniform fungicide/biocontrol (F/BC) trials will be developed as multi-PI, collaborative, integrated proposals. Coordinators for those integrated proposals are listed in Table 1 (FY09 RFP).

FY09 Research Priorities Derived from Action Plan Goals:

1. Validate integrated management strategies for FHB and DON.
2. Enhance communication and end user education/outreach.
3. Develop the next generation of management tools for FHB/DON control.
4. Develop a full understanding of specific environmental and biological factors influencing infection and toxin accumulation that can be used to develop the next generation of disease forecasting and DON risk assessment systems.

FOOD SAFETY, TOXICOLOGY AND UTILIZATION OF MYCOTOXIN-CONTAMINATED GRAIN (FSTU)

FY09 Program Description:

The Food Safety, Toxicology and Utilization of Mycotoxin-Contaminated Grain (FSTU) research area supports research on food safety and food processing issues related to the presence of *Fusarium* spp. mycotoxins in wheat and barley grain. Practical outcomes of research in this area include: 1) improved toxicological data to assure that current guidelines are providing the appropriate safety factors for the consumer; 2) analytical tools that can be used by small grain producers, elevators, millers, and processors, to rapidly and reliably identify mycotoxin-contaminated grain; 3) develop appropriate strategies to deal with contaminated grain; and 4) diagnostic data on *Fusarium* spp. mycotoxins required for development of FHB resistant/tolerant varieties of wheat and barley.

FY09 Research Priorities Derived from Action Plan Goals:

1. Provide analytical support for DON/trichothecene quantitation for Initiative's stakeholders.
2. Provide requisite information on DON/trichothecene safety issues to producers, millers, researchers, risk assessors, and regulators.

GENE DISCOVERY AND ENGINEERING RESISTANCE (GDER)

FY09 Program Description:

The Gene Discovery and Engineering Resistance (GDER) research area (RA) will focus primarily on development of engineered strategies to FHB resistance, and on the identification of candidate genes for resistance from wheat, barley and other plants. Gene discovery and transformation of non-cereal systems will be supported for the purpose of rapidly screening potential anti-*Fusarium* genes**.**

FY09 Research Priorities Derived from Action Plan Goals:

1. Characterize the genetic function of existing and novel loci for FHB resistance.
2. Increased efficiency of identification of candidate genes for resistance against FHB and reduced DON accumulation.
3. Develop effective FHB resistance through transgenic strategies.

PATHOGEN BIOLOGY AND GENETICS (PBG)

FY09 Program Description:

Research in this area includes studies that address pathogen diversity and mycotoxin biosynthesis on plants, host/parasite interactions, and host resistance mechanisms that target the pathogen. Research in PBG should complement and be linked to whole plant research that will lead to disease control and/or toxin reduction strategies. Population surveys should be accompanied by studies of biological relevance. Successive yearly surveys cannot be supported by this program, as funding is limited.

FY09 Research Priorities Derived from Action Plan Goals:

1. Characterize genetic variation in the pathogen population with regard to aggressiveness toward plants and mycotoxin potential.
2. Characterize plant-fungal interactions in plant lines being developed by researchers in the USWBSI.
3. Develop new strategies for reducing the impact of FHB and associated mycotoxin contamination in barley and wheat.

VARIETY DEVELOPMENT AND HOST RESISTANCE (VDHR)

FY09 Program Description:

The VDHR research area will be Uniform Nursery based in the case of soft winter wheat and spring wheat. States will be aligned with the uniform nurseries as follows: Uniform Regional Scab Nursery for Spring Wheat Parents (MN, ND, SD, MT); Uniform Northern Winter Wheat FHB Screening Nursery (NY, MI, OH, IN, IL, MO, KY); Uniform Southern Soft Red Winter Wheat FHB Screening Nursery (NC, MD, VA, AR, GA, LA). VDHR research will be commodity-based in the case of barley, durum and hard winter wheat coordinated projects.

Each Uniform nursery will be coordinated by a regional committee, chaired by existing nursery coordinators. Nurseries will be conducted in collaboration with a pathologist wherever possible and a subset of promising entries may be grown at multiple locations in Integrated Management Trials. The nurseries will also be evaluated for milling and baking quality, and haplotyped at the USDA regional genotyping labs. The most promising lines may be entered in the nurseries for a second year of testing at the lines originator's request. Collaborators will submit candidate parents for crossing, and prebreeding populations derived from these crosses/populations will be made available to all collaborators. Mapping of new resistance sources will be accomplished through joint phenotyping of populations. All collaborators must screen varieties planted commercially (>5% of wheat acreage) in their state for FHB resistance and provide this information to growers.

NOTE: Individual proposed research projects in this area will not be solicited until FY10.

FY09 Research Priorities Derived from Action Plan Goals:

1. Increase acreage planted to varieties exhibiting improved FHB resistance.
2. Increase efficiency of individual breeding programs to develop and release FHB resistant varieties.
3. Develop new breeding technologies and germplasm to further enhance short term and long term improvement of FHB resistance and to efficiently introgress effective resistance genes into breeding germplasm.