FY08 Research Area Program Descriptions and Research Priorities

FHB MANAGEMENT (MGMT)

FY08 Program Description:

The FHB Management (MGMT) research area supports research to develop and test 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; disease management decision tools, and advanced knowledge pertaining to disease development, studies on the refinement and deployment of disease prediction and forecasting models; studies on pathogen survival, inoculum production, dispersal, infection, colonization, and mycotoxin production, and 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.

FY08 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)

FY08 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.

FY08 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)

FY08 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**.**

FY08 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 & GENETICS (PBG)

FY08 Program Description:

Research in this area includes studies that address pathogen diversity, mycotoxin biosynthesis, host/parasite interactions at the molecular level, and host resistance mechanisms at the molecular level 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. Annual population surveys will receive a low priority.

FY08 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)

FY08 Program Description:

The Variety Development and Host Resistance research area combines three previous research areas: Variety Development and Uniform Nurseries (VDUN), Host Genetics and Genomics (HGG), and Host Genetic Resources (HGR). The types of research that area appropriate for VDHR, therefore, are breeding, cultivar and germplasm development, participation in uniform FHB nurseries, marker-assisted selection and QTL mapping and incorporation of novel resistance from wide crosses into useful germplasm. Collaborative projects with components in other research areas, such as evaluation of varieties or breeding lines varying in FHB resistance with and without fungicide treatment, would be appropriate for inclusion in VDHR.

VDHR is built around existing Uniform FHB Screening Nurseries: Uniform Regional Scab Nursery for Spring Wheat Parents (MN, ND, SD, MT) – this nursery includes Durum; 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). These nurseries now provide a mechanism for evaluating promising new scab resistant lines, but under VDHR their role will be expanded to include a second year of testing for the best lines, and testing a subset of the best lines in multi-location Integrated Management Trials in collaboration with a plant pathologist.

Further, the uniform nursery structure provides PIs with a cadre of regional collaborators for any activity appropriate to this area, such as mapping of new resistance sources through joint, collaborative multi-location phenotyping, or joint evaluation of resistance from wild relatives. VDHR researchers are expected to submit a list of the parents they use for improving FHB resistance, and be willing to share prebreeding populations derived from these crosses with all collaborators. All collaborators must screen varieties planted commercially (>5% of wheat acreage) in their state for FHB resistance and post results on a website.

NOTE: Individual proposed research projects should be submitted to the appropriate Coordinating Committee (see Table 1, page 6) who will then compile individual proposed research projects into a Coordinated Project Pre-Proposal. Proposed VDHR research on Barley or Hard Winter Wheat should be submitted to the Barley or Hard Winter Wheat Coordinated Projects, respectively.

FY08 Research Priorities derived from Action Plan Goals:

1. Increase acreage planted to varieties exhibiting improved FHB resistance.
2. Increase efficiency of individual breeding programs' development of FHB resistant varieties.
3. Increase efficiency of introgression of effective resistance genes into breeding germplasm.
4. Develop and map diagnostic markers for effective sources of FHB resistance.