
Call for Research Ideas: *Heat and Drought Wheat Improvement Consortium -HeDWIC-*

July, 2014

The Intergovernmental Panel on Climate Change predicts that by 2050, mean temperatures on a global scale may rise by between 2° to 5°C or more, while rainfall and distribution will be less predictable and more extreme. Most of the world's low-income families live in climate vulnerable regions, namely in Africa and Asia, so climate change represents a major challenge to future food security and farmers' livelihoods. For these reasons, as part of a new strategy to underpin food security, the Consultative Group on International Agriculture's ([CGIAR](#)) Research Program on Wheat ([CRP WHEAT](#)) will establish a multidisciplinary partnership, to capture global expertise and resources, tentatively named the *Heat and Drought Wheat Improvement Consortium -HeDWIC-*. Development of HeDWIC is being facilitated by The International Maize and Wheat Improvement Centre -[CIMMYT](#)- (the organization that spearheaded the Green Revolution in the 1960s and leads the International Wheat Improvement Network, delivering improved wheat germplasm as an international public good to wheat programs worldwide through extensive partnership) in consultation with an international group of stakeholder organizations, under the CGIAR Research Program on Wheat.

In order to launch this initiative and to frame the discussion around the best ideas worldwide in plant stress technology, research ideas are invited for presentation at a conference in Frankfurt am Main, Germany (1-4th December, 2014), at which other stakeholders will be present, including a number of funding organizations that have expressed interest in the HeDWIC initiative. Attendance of researchers whose proposals are selected for presentation will be sponsored.

Applications will be treated with complete confidentiality and should be made at the following website by September 1st 2014:

[Website Form](#)

Preamble. While not compulsory, applicants are encouraged to position their research proposal in the context of the attached 'Research Framework' that outlines broad approaches for tackling stress adaptation in crops

- Scientists and Affiliations
- Title of proposed research
- Thematic areas addressed (with reference to attached Research Framework)
- Expected impact on wheat productivity, under what environments, and estimated timeframe for delivery (max 75 words)
- Summary of plant processes that will be improved as a result of application of research (max 100 words)
- Outline the main research methods (max 150 words)
- Anticipated impact pathway -from research outputs to genetic gains- (max 100 words)
- Novelty of approaches (max 75 words)
- Risks and assumptions (max 75 words)
- Relevant achievements of named research group (up to 12 citations, patents, or other documented impacts)



Research
Program on
WHEAT



Bayer CropScience

Science For A Better Life

 CIMMYT^{INTL}

Research framework to improve heat and drought adaptation of wheat.

A broad research strategy for improving stress adaptation of wheat is summarized below, under three main components. Components 1 & 2 encompass basic research on major stress adaptive characteristics that are expected to contribute to improved performance under heat and drought stress (based on precedent and theory in published literature). Component 3 represents a series of implementation steps required to harness cutting edge breeding approaches aimed at WHEAT regions.

The choice of Research components and implementation steps should provide either (i) a high likelihood of delivery within the foreseeable future -based on experimental data- or (ii) somewhat higher risk approaches -risky in as much as significant knowledge gaps may exist-, where impacts are expected to be large. The research in HeDWIC will not duplicate work in other areas of the CRP-WHEAT framework, or other ongoing research projects on heat and drought, but will instead link with them to capitalize for example, on outputs from *IWYP*, *Seeds of Discovery*, *WISP*, etc. To assure coordination with other research projects, HeDWIC will also link with expert groups under the G-20 Wheat Initiative, which aim to better coordinate national members' wheat R&D priorities and programs. The rationale and a brief scientific outline are presented below:

Component 1: Resource Capture and Utilization Efficiency.

This Program would encompass research on the main plant characteristics that must be genetically optimized to maximize growth potential (i.e. accumulation of plant biomass) under heat or drought stress:

- *Root system function and architecture.*
- *Water use efficiency (water budgets & mild dehydration tolerance)*
- *Thermo-stability of enzymes & membranes*
- *Oxidative stress and photo-protection*
- *Respiration*
- *Canopy development and N dynamics.*
- *Increasing photosynthetic capacity and efficiency (Linking to [International Wheat Yield Partnership](#))*

Component 2: Reproductive Growth and Resource Partitioning

Research areas in Component 2 would ensure that both reproductive growth and partitioning processes are well adapted to target environments, thereby maximizing grain harvest index (HI) and ensuring the utility and nutritional quality of the grain under heat or drought stress:

- *Ensuring floret fertility*
- *Understanding stress signalling and whole plant regulation*
- *Optimizing carbohydrate partitioning and storage*
- *End-use quality*
- *Optimizing structural dry matter partitioning to different organs (Linking to IWYP)*
- *Local adaptation of reproductive growth (Linking to IWYP)*

Component 3: Impact targeting, and strategic deployment of traits and alleles

Component 3 represents the steps of a research and delivery pipeline -underpinned by solid informatics capability- that integrate research in Component 1 and 2 into a breeding, testing, and dissemination pipeline:

- *Trait targeting to ensure breeding targets are focused and are complementary to ongoing socio-economic conditions as well as 'climate smart' precision agriculture and other crop management initiatives (for example, the CGIAR Research Program on Climate Change, Agriculture and Food Security ([CCAFS](#)), The Agricultural Model Intercomparison and Improvement Project ([AgMIP](#)) and MasAgro Take it to the Farmer ([MasAgro TTF](#)), among others).*
- *Genetic resource exploration (linking to the CRP-Wheat initiative [Seeds of Discovery](#))*
- *Phenotyping (linked to the expert working group of the same name under the Wheat Initiative)*
- *Gene discovery (linked to [WISP](#), [Breedwheat](#), and related gene discovery programs)*
- *Data management and bioinformatics*
- *Trait and molecular breeding – transferring new alleles for heat and drought tolerance into elite lines*
- *International testing*
- *Global dissemination of new germplasm and breeding technologies through the International Wheat Improvement Network ([IWIN](#))*



Research
Program on
WHEAT



Bayer CropScience

Science For A Better Life

CIMMYT