

**Generation Challenge Programme:** New commissioned proposals in the context of the CI  
**MARCH 2009**

**Project Title: Molecular breeding and selection strategies to combine and validate QTLs for improving WUE and heat tolerance of wheat in India**

Targeted Challenge initiative: **WHEAT**

Targeted Subprogram: **SP1-SP2-SP3-SP5**

Principal Investigator and Lead Institution: Dr. K. V. Prabhu, IARI, **ICAR, New Delhi**

Specific Target Countries: **India**

**Participating Institutions in India: IARI, New Delhi, NRCPB, New Delhi; PAU, Ludhiana, J.N.K.V.V., Powarkheda, Agharkar Research Institute, Pune**

Collaborating Scientists and Institutions: **CIMMYT, University of Sydney**

### **Executive Summary**

Precise phenotypic data underpins genotyping and much of the breeding process. This project aims to assemble and integrate into breeding programs genetic diversity for WUE and heat tolerance from key sets of genetic resources (including drought-adapted cultivars, advanced lines, landraces, products of inter-specific hybridization and mapping population parents from China, India, CIMMYT, ICARDA, Australia etc.). Many of these materials will be multiplied and provided by CIMMYT. The lines will be shared among the project partners so that analysis of trait and QTL by environment interaction and assessment of genetic gains associated with each trait can be evaluated in target breeding environments. Characterization of target experimental sites will be essential to interpret data, while training in standardized phenotyping protocols for measuring heat and drought adaptive traits and high throughput genotyping will facilitate precise characterization, in all environments, of traits and genotypic variation as well as build human resource capacity.

QTLs have been identified for stress adaptation in a range of different wheat mapping populations. Many of the parents of these populations are adapted cultivars with good agronomic type. The challenge now is to combine these QTLs in a breeding program using marker assisted recurrent selection (MARS) and backcrossing. We propose combining existing QTLs for performance under moisture stress in elite Indian backgrounds using a combination of empirical selection for yield, marker selection for genomic regions and selection for relevant physiological traits. The QTLs will be combined using MARS and backcrossing strategies. Validation of the QTLs will be conducted concurrently under managed stress in India as part of objective 1. The expectation is that the frequency of favorable alleles for tolerance to moisture stress will be improved.