Foreword

Most regions with extensive poverty in Asia are dominated by rainfed ecologies where rice is the principal source of staple food, employment, and income for the rural population. Success has been limited in increasing productivity in rainfed rice systems. Poor people in these ecosystems lack the capacity to acquire food, even at lower prices, because of low productivity in food production and limited employment opportunities elsewhere. Among all abiotic stresses, drought is the major constraint to rice production in rainfed areas across Asia and sub-Saharan Africa. At least 23 million hectares (20% of rice area) are potentially affected in Asia alone. Frequent droughts result in enormous economic losses and have long-term destabilizing socioeconomic effects on resource-poor farmers and communities.

In the context of current and predicted water scarcity scenarios, irrigation is generally not a viable option to alleviate drought problems in rainfed rice-growing systems. It is therefore critical that genetic management strategies for drought focus on maximum extraction of available soil moisture and its efficient use in crop establishment, growth, and maximum biomass and seed yield. However, success has been limited in drought-prone rainfed systems. The rice yields in these ecosystems remain low at 1.0 to 2.5 t ha^{-1}, and tend to be unstable due to erratic and unpredictable rainfall. Drought mitigation, through improved drought-resistant rice varieties and complementary management practices, represents an important exit pathway from poverty.

Recent advances in drought genetics and physiology, together with progress in cereal functional genomics, have set the stage for an initiative focusing on the genetic enhancement of drought resistance in rice. Extensive genetic variation for drought resistance exists in rice germplasm. However, the current challenge is to decipher the complexities of drought resistance in rice and exploit all available genetic resources to produce rice varieties combining drought adaptation with high yield potential, good quality, and tolerance of biotic stresses. The aim is to develop a pipeline for elite "prebred" varieties or hybrids in which drought-resistance genes can be effectively delivered to rice farmers.

The Frontier Project on Drought-Resistant Rice will scale up gene detection and delivery for use in marker-aided breeding. The development of high-throughput, high-precision phenotyping systems will allow genes for component traits to be efficiently mapped, and their effects assessed on a range of drought-related traits, moving the most promising genes into widely-grown rice mega-varieties. To that end, IRRI will establish a drought consortium involving top scientists from both national agricultural research and extension systems and advanced research institutes, and will develop partnerships with extension services and the private sector for the development and evaluation of drought-resistant rice.

IRRI was pleased to convene a planning workshop for the Drought Frontier Project, bringing together some of the most eminent scientists from around the world, to discuss and devise an appropriate research agenda for this project, and to establish the partnership mechanisms for its implementation. The objectives of this workshop were to (1) assess the current status and future challenges facing rice cultivation in drought-prone environments; (2) review the recent progress, breakthroughs, and potential impact of drought research in rice and other tropical crops; (3) identify priority research areas and state-of-the-art methodologies and approaches to tackle drought challenges; and (4) establish a research consortium and an integrated research strategy on drought resistance in rice.

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