

Plant genomics for bringing stress relief in the field¹

Hei Leung

**Plant Breeding, Genetics and Biotechnology Division
International Rice Research Institute
DAPO Box 7777, Manila, Philippines**

Abstract

Environmental stresses are the main constraints for crop productivity. Many stresses are likely to intensify under the projected scenarios of climate changes (Intergovernmental Panel on Climate Change Working Group II; URL: <http://www.ipcc-wg2.org>). Advances in plant genomics and molecular biology offer promises to address these intractable problems. While interesting results have been generated in the laboratories, conversion of such results into products useful in the field has proved more challenging. The main challenges are achieving stability of resistance against variable biological agents and defining the genetic basis of traits influenced strongly by genotype x environment interactions. Rice provides a good example to assess the status and potential of applying gene discovery in the field. Rice has many of the genetic and genomic tools available in a model organism—complete genome sequence, large collections of mutant stocks, many specialized mapping populations, and extensive breeding networks to implement marker-assisted breeding. Progress and bottlenecks seen in rice can provide good lessons for other crops. In this presentation, I will illustrate with recent examples how genomics and molecular biology have been translated into useful products and speculate on where the potential may lie. Integration along the continuum of gene discovery, breeding, and on-farm validation will be the key for successful translation of research results into practical products. International agricultural research centers together with their partners in developing countries can play a critical role in such integration by providing publicly accessible genetic resources, capability for biological evaluation of important traits, and validation of products in the field.

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