

Summaries:

Executive Summary

The rainfed lowland rice ecosystem is the major food production system in the Mekong region, covering Northeast Thailand, Laos and Cambodia. Drought is considered to be the main constraint for rice production, and development of drought resistant varieties will stabilize yield in the region.

Over the last 10 years, NARS and BIOTEC of Thailand, CARDI of Cambodia, NAFRI of Laos, and the University of Queensland have had collaborative programs on drought tolerance improvement, supported by the Rockefeller Foundation and the Australian Center for International Agriculture Research. Field screening for drought tolerance was conducted, more than 20 populations from crosses between parents with drought tolerance and popular varieties have been developed, a few secondary traits such as leaf water potential, have been identified as potentially useful, and QTLs and their linked markers for drought tolerance have been identified and developed. We have adopted a concept that widely acceptable varieties require drought tolerance and high yield potential. However, research is required to improve strategies for selecting for yield potential, to test the identified drought tolerant traits and the genotypes in different drought environments, and to identify drought-prone areas that are suitable for these genotypes.

The objective of this proposed project is to develop strategies and protocol for selection of drought tolerant genotypes by using diverse populations which have been developed by us. This study will be conducted in Thailand, Laos and Cambodia. A strong advantage of our work is that the populations have been developed from popular varieties and donors which have been identified for drought tolerance under field condition. The outcome of this work, in addition to developing strategies for selecting drought tolerance, will be release of drought tolerant genotypes as commercial varieties, identification of traits corresponding to adaptation to aerobic condition, confirmation of putative secondary traits, and GIS maps that identify drought prone areas.

Scientific Summary

Drought is considered to be a major production constraint for rainfed lowland rice in the Mekong region. We propose to develop new effective breeding strategies for selection of adapted genotypes using our populations, which we had developed in Thailand, Laos and Cambodia.

We will use 3 approaches; conventional, modeling and farmer participatory. In the conventional approach, there will be phenotyping under controlled field screening for tolerance to different types of drought and also for general adaptation. In addition to multi-location trials, evaluation of selected genotypes will use farmer participatory variety selection with the Mother and Baby design. In order to identify target areas of different drought types particularly early and late season drought, maps of drought development patterns will be produced using simulation modeling and GIS techniques.

Traits involved in adaptation to different growing conditions and new drought traits will be investigated. In drought-prone rainfed lowland conditions, rice plants often experience both anaerobic and aerobic conditions. Thus, our hypothesis is that acceptable genotypes need to be well adapted to both growing conditions, and also possess drought tolerant traits.