

Technology Fact Sheet

Technology transfer of drought and flood tolerance rice technologyⁱ

Rice is the most important staple food crop of the world's as well as Indonesia's population. The immediate impacts of climate change on rice production systems and food security will be felt in the form of adverse effects of extreme weather events on rice production. Floods also cause indirect damage to rice production by destroying the properties and production means of farmers, and infrastructures supporting rice production such as dams, dikes, roads, etc.

Less immediate but possibly even more significant impacts are anticipated due to changes in mean temperatures, increasing weather variability, and sea level rising. Rice cultivation is both an important *sequester of carbon dioxide from the atmosphere* and an important *source of greenhouse gases* (e.g. methane and nitrite oxide) *emission*. In 2004, for example, the global paddy rice output was 607.3 million tonnes at 14% moisture content. At the grain/straw ratio of 0.9 for most currently planted rice varieties, the global rice straw output in 2004 was about 676 million tonnes at 14% moisture content. This means that in 2004, rice *sequestered about 1.74 billion tonnes of CO₂ from the atmosphere* to produce about 1.16 billion tonnes of biomass at 0% moisture content.

In Indonesia, rice for drought and flood tolerance has been developed by Center of Rice Research (BaLitPa), Ministry of Agriculture, Sukamandi, West Java. The drought tolerance type rice is developed from local type of *gogo ranch* that grows in a dry land whereas the flood tolerance type is developed from one that grows in swamp land.

Varieties developed are as a result of local exploration capability which the seed has been taken from the germ plasm in its origin media, i.e. swamp and dry field soil. Variety of rice that is tolerance to drought and flood is flexible towards climate change because by the implementation of cropping calendar made by Ministry of Agriculture, it can be planted the a year long. Because of its varieties the rice seed can adapt both dry and flood conditions.

Biotechnology that is applied to produce drought and flood tolerance rice can be employed as a technology of priority. The rice produced has to fulfil important criteria, such as environmental, social and economic aspects. From the environmental criteria, the rice that is drought and flood tolerance can be grown in related types of soil, such as in the dry land for the drought tolerance or in a swamp condition for the flood tolerance. Dissemination of these varieties of rice has to involve agricultural instructors into groups of farmers so that most of the farmers who is currently only knowing local rice seed will easily use the new drought and flood tolerance of rice varieties.

There is quite significant difference in term of cost needed in treating the rice field. The cost for low mechanical intensity is US\$ 10,000 – 20,000 TPD, while using high mechanical intensity is about US\$ 25,000 – 50,000 TPD. Operational and maintenance cost is around US\$ 30-50/ ton. Example of technical criteria on dissemination of drought and flood tolerance rice cultivation is summarized in Table A (which can be seen in the Appendix below).

Appendix

Table A Criteria of dissemination of drought and flood tolerance rice varieties

Technical Criteria	Description
Technology Maturity	• It is already applied
Local Availability	• Seed variety has been created from the germ plasm in its origin media taken from swamp and dry field land of Indonesia
Operational flexibility	• It is done with planting calendar so it can be created rice production in whole year
Climate Suitability	• It is able to adapt to dry season or wet season (flooded time)
Technology to be included in prioritization	• Biotechnology is used for selection and nurturing of drought and inundated resistant rice varieties
Environmental Criteria	
Resource Conservation	• The rice varieties are automatically conserved because they are planted in their suitable habitats
Land	• Dry and wet land
Social Criteria	
Employment	• Farmers and rice field supervisors
Public perception	• Farmers are not yet aware for drought and inundated resistant rice varieties instead of local rice varieties
Community Involvement	• Farmer group
Economic Criteria	
Capital Cost	• US\$ 10,000 – 20,000 TPD (low mechanical intensity) • US\$ 25,000 – 50,000 TPD (high mechanical intensity)
Operational & maintenance costs	• S\$ 30-50 /ton
Market availability	• It is already available

ⁱ This fact sheet has been extracted from TNA Report - Adaption for Indonesia. You can access the complete report from the TNA project website <http://tech-action.org/>