
Chapter 26

What is Happening to the Diversity of Rice Genetic Resources in China?

Pei Yanlong, W. Lianzheng,
Gao Li Zhi, and Hong De Yuan

Rice (*Oryza sativa* L.) is the most important grain crop in China. More than half of the population of China depends on this cereal and China takes the first place in the world for total rough rice output and the second place for total rice cultivation area. In 1990 rice was cultivated on about 33.06 million ha, with a total gross rice output of 191.75 million tons.

Box 26.1

The Current Status and Prospects for Conservation of the Genetic Diversity of Rice and Its Wild Relatives in China

China once had a very rich diversity of land races, wild species, and wild relatives. At present, genetic erosion in cultivated rice is reported to be high at both the varietal and the species' levels. This has been caused largely by social factors: technology diffusion, commercialisation, changing preferences, over-exploitation, and government policy. Farmers are increasingly interested in growing hybrid rice because of high yields and the secure government seed supply system. The immediate impact has been seen in the rapid decrease in cultivation of land races. There has been a 46-fold reduction in local varieties within four decades. Land races are not officially promoted and seed is not available through official channels. Knowledge about the proportion of marginal land planted with rice land races is scanty.

The status of wild rice is also not very promising. *Oryza rufipogon* is already considered to be endangered, and the populations of *O. officinalis* and *O. meyeriana* are dwindling fast. The main reason is rapid urbanisation and construction which is destroying the natural habitat of wild rice in China. It is believed that *ex situ* collection of wild rice would be sufficient for breeding purposes if wild rice is lost from the natural habitats. The gene flow from wild rice to land races, and from cultivated rice to wild rice, has been a dynamic process and its value cannot be underestimated.

The Genetic Diversity of Cultivated Rice and Its Wild Relatives in China

The diversity of varieties of cultivated rice in China is shown in the diversity of ecological adaptation characteristics and in the morphological polymorphy. Studies on the classification of cultivated rice have shown its high level of genetic variability and provided scientific evidence for further use and improvement of varieties. The main agronomic traits of cultivated rice in China have been identified and evaluated.

The variability of esterase isozymes was studied in 226 rice varieties and plentiful zymogram types indigenous to Yunnan Province, especially south-west Yunnan (Zhu Yinggno et al. 1984). Two hundred and fifty-two accessions of indigenous rice varieties from Yunnan were investigated using horizontal starch gel electrophoresis, and abundant genetic variability was found at six loci out of seven loci scored. Other studies have confirmed that cultivated rice from Yunnan has the highest level of Genetic Diversity in China, as shown by isozymes (Xiong Jianhua 1987, 1988; Cai Hongwei et al. 1992).

Why are Wild Rice Species in Danger in China?

There are two reasons for losing biodiversity, one is natural extinction and the other is human activity. Wild rice, *O. rufipogon*, grows in sunny habitats such as marshes, ponds, and ditches, or on the mountain valley slopes near or under the tropical and/or sub-tropical forests. In these areas the environment has been changing extensively because of the crowded population and growing commercialisation.

Human activities have changed the habitats of *O. rufipogon*. As the habitats became parched, humid plant species and even xerophytes invaded and competed with *O. rufipogon*. Deep water and strong pressures from grazing affected its natural propagation, reducing its superiority in the community. Both the habitat and structure of the *O. rufipogon* community is changing because of the activities of planting wild rice species such as *Zizania* spp and lotus (*Nelumbo nicifera* Gertn). The special natural habitats of *O. officianlis* and *O. meyeriana* have been destroyed as a result of felling trees, reclaiming land, and planting commercial crops such as rubber trees, bananas, and corn. The populations of *O. meyeriana* in Yunnan are threatened by the malignant weed, *Eupatorium coelestrium*, which is fast invading the tropical and sub-tropical forests of Yunnan.

Our investigation shows that the main reasons for the endangered status of wild rice species in China is human disturbance and habitat destruction. However, because of the limited understanding of values and lack of awareness of the results of the loss of Genetic Diversity of wild rice by the government and the

public, effective conservation measures have not yet been taken. At the present rate, wild rice will be extinct in China soon unless immediate efforts are taken to save it.

References

- Cai Hongwei, et al., 1992. *Studies on Classification of Asian Cultivated Rice Using Esterase Isozyme*, Southwest, UK: Acta Agriculture Universities.
- Xiong Jianhua, 1988. *Esterase Isozyme Studies on Varieties Classification of Cultivated Rice and Their Distribution in Yunnan*. Tropical Agricultural Research Series No. 21: 128-143.
- Xiong Jianhua et al., 1987. 'Ecotypic Differentiation and Geographical of Indigenous Rice Varieties in Yunnan Province of China Based on Isozyme Loci'. In Suzukis (eds) *The Proceedings of the International Workshop on Crop Genetic Resources of East Asia*. 221-229.
- Zhu Yingguo, Mei Jihua, 1984. 'Studies on Esterase Isozyme in Rice (*Oryza Sativa L.*), Indigenous to Yunnan. In *Journal of Wuhan University*, 1: 111-122.