

Genetic Diversity of Rice in Japan: Social, Environmental and Historical Dimensions

SATo Yo-Ichiro

Research Institute for Humanity and Nature, Kyoto, Japan

SATO Yo-Ichiro is a Deputy Director-General and professor at the Research Institute for Humanity and Nature (RIHN), Japan. He received his PhD from the Department of Agronomy, Kyoto University (1986). He was an assistant at Kochi University (1981-), a research associate in the National Institute of Genetics (1983-), an associate professor at Shizuoka University (1994-), professor at the RIHN (2003-present) and the Deputy Director-General at the RIHN (2008-present). His major field of interests is plant genetics. One of his interests is studying the origin and biodiversity in rice. His major publications include origin of *japonica* and *indica* rice: “*Japonica* rice carried to, not from, Island Southeast Asia”, *Nature Genet*, 40 (11): 1264-1265. (2008). He is also interested in archeobotany in Afro-Eurasia. He edited with two editors for publication of journal, “The Archaeobotany of Asian Rice, *Archaeological and Anthropological Sciences*, 2 (2): 57-131”. sato@chikyu.ac.jp

Abstract

Genetic diversity, or within-species diversity is an aspect of biodiversity, and it has been playing important roles for agro-ecosystems to be sustainable. On the Japanese archipelago, rice plant at the present time is grown from 24°N to 42°N, over 2000 kilometers in distance. To adapt to such wide variations in environmental conditions, rice plant was diversified into many varieties with different genes and characters. Both tropical and temperate *japonicas* were grown until the end of the Edo era (1603 – 1868). During the Medieval Age, a series of *indica* varieties called “*champa rice*” were introduced from Vietnam. This temporarily brought about an increment of a high level of genetic diversity among Japanese rice. Differential cooking ways and cultural requirements helped maintain various types of rice varieties, such as glutinous rice (mochi), red rice, and aromatic rice. By the beginning of the Modern Age, more than 4000 varieties were recognized and were actually grown for commercial use, but the number is now reduced to 88 varieties. Of these, only four varieties dominate approximately 65 percent of the total production, which are Koshihikari and its descendents. Before the 20th century, morphological inconsistencies as well as DNA polymorphisms existed even within a variety, suggesting that the society at that time was accepting *diversity*. Active selections by producers in their breeding program that required short stature, and more recently, a high level of cooking quality requested by consumers and the market resulted in the loss of genetic diversity in rice today. Recovering genetic diversity in commercial rice varieties is required to avoid a risk of epidemics. A couple of attempts for recovering a high level of genetic diversity will be introduced.

Keywords: rice; genetic diversity; cultural requirements; breeding, local variety