

Invited Paper

Biodiversity, Climate Change and Homeostasis in Crop Improvement

M.P. Dhanapala*

Former Director, Rice Research and Development, Department of Agriculture, Peradeniya, Sri Lanka

**Corresponding author: maddumadhanapala@yahoo.com*

Abstract

Biodiversity confers buffering capacity or homeostasis to living organisms and helps their survival under stress conditions of the environment. In agricultural crops, open pollinated species in particular, biodiversity declined with domestication and subsequent genetic improvement; the land races, open pollinated populations, composites, synthetics, clones, hybrids and inbred lines/pure-lines are plant breeding end products in the order of declining biodiversity while assuming homogeneity within populations.

In rice, significant decline of biodiversity by genetic erosion is noticed with the restriction of many traditional land races/varieties to a few pure-lines in 1940s; a few old improved varieties in 1960s and limited use of germplasm since 1970s to develop new improved varieties. Loss of biodiversity is irreversible but options such as varietal mixtures, advance bulk populations with little or no selection etc. are available to simulate biodiversity and thereby introduce homeostasis. However, the modern rice cultivars with proven stability and adaptability to a wide range of environments have inbuilt homeostasis or buffering capacity, even as homogeneous populations, because of rigorous screening in different agro-ecological environments before being recommended for cultivation.

The climate change signified by erratic rainfall and elevated temperatures at present cannot be considered alarming for rice cultivation in the country. The rainfall pattern and temperature fluctuations need to be monitored, if necessary, to redefine the rice cultivation seasons. The modern rice varieties possess the resilience needed to contain climate changes experienced today. They are photo-insensitive, period-fixed types with a growth duration range of 75 to 120 days, and can be grown year-round. They can fit into any cultivation period dictated by the climatic parameters.

In addition, the cropping system information may help sustain productivity in rice-based farming. However, the new technologies generated to mitigate climate change have to be appropriate for the farming community.

Keywords: Biodiversity, Buffering capacity Climate change, Genetic erosion, Homeostasis