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"Resilience of agricultural systems against crises"

Agrobiodiversity Management for Food Security

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Abstract

World population increases by approximately 78 million people annually. About 1 billion humans suffer from hunger and 3 billion malnourished people live with <US$ 2 daily. Anthropogenic climate change continues affecting food output and quality while the world continues facing an increasing demand for nutritious and quality food, feed, fiber and fuel. There will be 1.7 billion more people to feed by 2030, but with a declining ratio of arable land between 40 and 55 %. Agriculture needs eco-efficient and resilient systems to meet end-user demands. Such agro-systems should provide enough and safe food, enhance human health through better nutrition for the poor and well-balanced diets for the rich, diminish the use of fossil fuels, adapt to extreme weather and water stresses, reduce environmental degradation and decline in the quality of soil, water, air and land resources in an increasingly urbanized world, and be a source of raw materials for bio-energy and a bio-based economy in this 21st Century. Agro-biodiversity components act similarly in agro-systems than biodiversity in other ecosystems: genetic diversity or genetic variation within the species, species diversity or variation existing for species in a specific region, and ecosystem diversity comprising variation between agro-systems within a region. Agro-biodiversity provides means for intensifying sustainably crop yields and for adapting crops to climate change, e.g. genetic broadening helps introgressing new genes in breeding populations, intra-specific crop diversification (i.e., mixture of landraces or cultivars) provides a means for controlling effectively pathogens and pests over large areas, and genetically enhanced seed-embedded technology contributes to adapt to variable environments due to changing climate. Sustainable crop genetic enhancement consists of Identifying a useful character, manipulating its genetic variation, putting genes into a usable form, using DNA markers to monitor chromosomal changes and as selection aid, and genetic engineering to enhance useful variation if not available in crop gene pools.

Keywords: Genetic engineering, genomics, germplasm enhancement, plant breeding

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