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Significance of Biodiversity Conservation in Agriculture

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Introduction

The whole population of the world is expected to reach about eight billion by the year 2025. It is needed to accelerate the food grain production from the current level. To fulfill the requirement of more food, it will be essential to make improved use of a broader array of the world's plant genetic diversity or plant biodiversity. Biodiversity is a big term where bio means life and diversity means changes or variations. So in common term, biodiversity means array of variations among all form of lives (plants or animals). It is very complex in nature. In simplified format, biodiversity can be expressed in terms of genetic and species diversity. India is one of the richest nations in terms of plant biodiversity. India has diverse natural ecosystems ranging from the frozen and high Himalayan regions to the marine coasts; from the drenched north-eastern green forests to the arid northwestern deserts. India has different types of forests, wetlands, islands and the oceans. India consists of productive river plains and high plateaus and numerous major rivers, including the Ganga, Brahmaputra and Yamuna.

The miscellaneous physical features and climatic situations have created different ecological habitats like forests, grasslands, wetlands, coastal and marine and desert ecosystems, which harbour and uphold enormous biodiversity. India is also one of the twelve prime centers of origin of cultivated plants. Proficient use of plant genetic diversity is a requirement to meet the challenges of development, food security and poverty alleviation. Important objectives of conservation of plant genetic resources are: to increase cultivars that are particularly adapted to stress environments; to give surety of sustainable production in high-yielding environments, i.e. through less application of agro-chemicals. Assessment of conserved accessions and their use by farmers and plant breeders needs to be supported and facilitated. Many neglected species are particularly useful in subsidiary lands where they have been preferred to tolerate stress conditions and make contribution to sustainable production. These plant genetic resources (PGR) need to be evaluated for their outcrossing rates, yield potential, response to inputs, agronomic value and the amount of genetic variation for specific traits, to allow more efficient genetic improvement and promotion.

Database of plant genetic resources

Genetic resources may be divided into primary gene pool, secondary gene pool, tertiary gene pool and isolated genes. The primary gene pool consists of the crop species itself and other species that can be easily crossed with it. The secondary gene pool is composed of interrelated species that are more difficult to cross with the objective crop, i.e. where crossing is less successful and progenies are partly sterile. The tertiary gene pool contains species which can be used by employing special tissue culture related techniques like embryo rescue or protoplast fusion. The fourth important class of genetic resources, isolated genes, may derive from related or unrelated plant species.

Plant genetic resources are conserved in different genebanks in the world. World-wide, 1308 genebanks are registered in the WIEWS (World Information and Early Warning System on Plant Genetic Resources) database (http://apps3.fao.org/wiews/) and conserve a total of about 6 million accessions, containing major crops, underutilized or neglected crop species, as well as wild plants and trees. More than 3.6 million accessions of the 30 main crops are conserved ex situ. The CGIAR (Consultative Group of International Agricultural Research) System-wide Information Network for Genetic Resources (SINGER) associates the plant genetic resources information systems of the individual CGIAR centers on the world, permitting them to be accessed and searched together. The International Plant Genetic Resources Institute (IPGRI) is the world's largest non-profit agricultural research and training organization dedicated exclusively for documentation and promotion of agricultural biodiversity.

Plant genetic resources management

Gene banks are involved in the conservation of germplasm in different parts of the world. Numerous operations performed by the gene banks as accession Acquisition, Characterization, Dissemination (or distribution), General management, Germination/viability testing, In vitro conservation, Information and data management, Longterm storage, Medium-term storage, Short-term storage, Regeneration, Safety/security duplication and Seed processing.

Table 1: Organizations involved in biodiversity conservation of plant genetic resources in the world

Name of organization	Place	Crop
Asian Vegetable Research and Development Center (AVRDC)	Shanhua, southern Taiwan	Vegetables
Tropical Agricultural Research and Training Centre (CATIE)	Costa Rica	Cucurbita; *Capsicum*; *Phaseolus;* coffee; cocoa
Africa Rice Center (ADRDA/WARDA)	Cotonou, Benin	Rice
International center for Tropical Agriculture (CIAT)	Cali, Columbia	Cassava, beans, forages
International Maize and Wheat Improvement Center (CIMMYT)	Mexico	Wheat, maize
International Potato Center (CIP)	Lima, Peru	Potato
International Center for Agricultural Research in the Dry Areas (ICARDA)	Aleppo, Syria	Cereals, legumes
International Crops Research Institute for Semi Arid Tropica (ICRISAT)	Patancheru, Andhra Pradesh, India	Chickpea, Pigeonpea, Sorghum, Millet, Groundnut
International Institute of Tropical Agriculture (IITA)	Ibaden, Nigeria	Cowpea, Soybean, Yam, Bambara groundnut, *Musa* sp., Cassava, Rice
International Rice Research Institute (IRRI)	Philippines	Rice

Nordic Gene Bank (NGB)	Sweden	Cereals; fruits and berries; forage crops; potatoes; vegetables; root crops, oil crops and pulses.
Southern African Development Community-Plant Genetic Resources Centre (SPGRC),	Zambia	Base collections; duplicates of national collections
Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD),	Syrian Arab Rep.	Fruit trees
International Network for the Improvement of Bananas and Plantains (INIBAP)		Banana/plantain

Advantages of conservation of biodiversity

The major aim of conservation of biodiversity is to provide more attractive plant materials that are easier to use by plant breeders. Landraces grown in tremendous locations, e.g. semi-arid to arid regions in Asian and African countries, can be essential PGR in breeding for particular adaptation. These PGR can be used as donors for individual monogenic character; basis of new quantitative dissimilarity for adaptation to specific stress conditions; and breeding population or crossing associate in the expansion of superior, locally adapted cultivars for similar or other subsidiary areas. Production and applications of artificial seeds are also important in conservation and utilization of plant diversity in crop improvement. Genetic resources naturally are full of novel phenotypes, which are generally present in low frequencies and which are sometimes non-competitive or unproductive, such as a dwarf or very early flowering plant among tall, vigorous, later flowering ones. This can stimulate plant scientists to form and test hypotheses about the expression of the traits that distinguish them, and to utilize these traits for crop improvement. Different crop species and varieties require different minerals, soils and amounts of water to thrive in. Traditional farming techniques based on diversity, such as crop rotation, ensure that the soil has time to regenerate and maintain health over time. Diverse crops and land use also attracts and sustains a variety of pollinators. It also provides conditions for natural pest predators that help farmers save on insecticide costs. Climate change has become a major factor in world agriculture with focus shifting to crop varieties, which would be resilient to drought, floods, high temperatures and other adverse conditions. It is argued that plant genetic resources in the form of landraces and local varieties developed over thousands of years in stress environments can provide valuable genetic diversity for the development of such varieties which can be grown in adverse conditions.