

The Importance of Plant Breeding

Plant breeding has been practiced for thousands of years, since near the beginning of human civilization. Today it is now practiced worldwide by individuals such as gardeners and farmers, or by professional plant breeders employed by organizations such as government institutions, universities, seed and biotechnology companies, and research centers.

WHAT IS PLANT BREEDING?

Plant breeding is the art and science of changing the genetics of plants for the benefit of humankind. Plant breeding uses principles from a variety of sciences to improve the genetic potential of plants. The process involves combining parental plants to obtain the next generation with the best characteristics. Breeders improve plants by selecting those with the greatest potential based on performance data, pedigree, and more sophisticated genetic information. Plants are improved for food, feed, fibre, fuel, shelter, landscaping, eco-systems services and a variety of other human activities.

Plant breeding goes by various names including cultivar development, crop improvement, and seed improvement. More specifically, breeding involves the creation of multi-generation genetically diverse populations on which human selection is practiced to create adapted plants with new combinations of specific desirable traits. The selection process is driven by biological assessment in relevant target environments and knowledge of genes and genomes. Progress is assessed based on gain under selection, which is a function of genetic variation, selection intensity, and time.

THE ROLE OF PLANT BREEDING

International development agencies believe that breeding new crops is important for ensuring food security by developing new varieties that are higher-yielding, resistant to pests and diseases, drought-resistant or regionally adapted to different environments and growing conditions. Plant breeding in certain situations may lead the domestication of wild plants.

For as long as the world population is expected to continue to increase, there will continue to be a demand for more food. However, with an increasing population comes an increasing demand for land for residential, commercial, and recreational uses. Sometimes, farmlands are converted to other uses. Increased food production may be achieved by increasing production per unit area or bringing new lands into cultivation. Some of the ways in which society will affect and be affected by plant breeding in the future are as follow:

1. New Roles of Plant Breeding

The traditional roles of plant breeding (food, feed, fibre, and ornamentals) will continue to be important. However, new roles are gradually emerging for plants. The technology for using plants as bioreactors to produce pharmaceuticals will advance; this technology has been around for over a decade. Strategies are being perfected for use of plants to generate pharmaceutical antibodies, engineering antibody-mediated pathogen resistance, and altering plant phenotypes by immunomodulation.

FAST FACTS

Source: FAO

Plant Breeding is responsible for about 50% of crop productivity increase over the last century, while the remainder of the yield increase comes from better crop management (e.g., fertilization, irrigation, weeding).

The sciences supporting Plant Breeding, e.g. molecular biology, are advancing rapidly and plant breeding will provide even greater contributions in the near future.

Plant Breeding must be one of the highest priorities of government, policy makers, and donors to ensure food in quality and quantity available to an each day hungrier world.

2. New Tools for Plant Breeding

New tools will be developed for plant breeders, especially, in the areas of the application of biotechnology to plant breeding. New marker technologies continue to be developed and older ones advanced. Tools that will assist breeders to more effectively manipulate quantitative traits will be enhanced.

3. Training of Plant Breeders

Plant breeding programs have experienced a slight decline in graduates in recent past. Because of the increasing role of biotechnology in plant genetic manipulation, graduates who combine skills and knowledge in both conventional and molecular technologies are in high demand. It has been observed that some commercial plant breeding companies prefer to hire graduates with training in molecular genetics, and then provide them with the needed plant breeding skills on the job.

4. Yield Gains of Crops

With the dwindling of arable land and the increase in policing of the environment by activists, there is an increasing need to produce more food or other crop products on the same piece of land in a more efficient and environmentally safer manner. High-yielding cultivars will continue to be developed, especially in crops that have received less attention from plant breeders. Breeding for adaptation to environmental stresses (e.g., drought, salt) will continue to be important, and will enable more food to be produced on marginal lands.

RETURN ON INVESTMENT IN PLANT BREEDING

Food security: developing varieties with higher productivity and better yield stability.

Social benefits: developing more profitable varieties for poverty alleviation.

Economic benefits: developing drought resistant varieties that help reduce production costs, improving viability in marginal agribusinesses. A more profitable agribusiness results in more revenues and higher gross domestic product.

Environmental benefits: developing varieties less dependent on pesticides or more efficient in water and nutrient use.

Source: FAO