

Development of a Commercial Variety Through Conventional Breeding: Rice

by

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Different plant breeding techniques are available for improving the quality and quantity of crops. Among them are:

A. Conventional Breeding

Conventional plant breeding consists of the identification and selection of desirable traits and the combination of these into one individual plant (Kung, 1993). Four methods are employed by plant breeders to attain these goals (Kung 1993).

- 1. Pure line selection** involves selection from the extremes for the desired phenotype. Inbreeding is done repeatedly until the desired trait reach homozygous state in a plant. One advantage of pure line is the great precision with which they produce themselves. However, expression of some harmful genes and elimination of some desirable genes is also a possibility in this method. Since genetic recombination follows an independent assortment, the progenies obtained contain many different genotypic and phenotypic recombinations. Thus, in pure line breeding, a large array of plants should be generated in the crossing work so that the desired phenotype will come out.
- 2. Hybrid breeding** involves the combination of pure lines to form heterozygotes and results in the formation of large-sized and large-fruited plants. Farmers must buy the hybrid seeds every planting time. The concept of heterosis is in play whereby the characters of the offsprings are much better compared to the parents – termed as hybrid vigor. The three line system in hybrid breeding is comprised of the cytoplasmic male sterile A line, the maintainer or B line (maintains the male sterility of the A line) and the restorer, which when crossed with the A line produces the F1 hybrid seed. There is also the two-line system, which uses the nuclear thermogenic male sterile line whose male sterility and fertility is induced by temperature or photoperiod.

3. **Mutation breeding.** Introduction of variabilities through the use of physical and chemical mutagenesis. Carry many undesirable traits in the mutants, thus requiring large number of mutants to be evaluated.
4. **Formation of polyploids** is employed to improve crops using colchicines and other systems. Polyploids may also respond differently to environmental conditions than their diploid counterpart. In the case of allopolyploids, there is likewise higher potential capacity for variation.

While conventional plant breeding is still employed, the method is considered time consuming and the outcomes are not always desirable, for coupled with the gene of interest are unknown genes which may be carrying undesirable traits and may also be transferred. In the process of breeding, some genes with desirable traits may be lost.

B. Development of the rice variety: the Rice Varietal Improvement Group

Three institutions: PhilRice, IRRI and UPLB develop rice varieties in the Philippines. Farmers are also encouraged to register any new variety that they have from their selections in our germplasm bank.

In the breeding institutions, pure lines are developed by crossing varieties which possesses good agronomic characteristics, high yield and are resistant to diseases. F1 to F5 generations are obtained using pure line breeding methods as bulk selection, pedigree, single seed descent, or single hill descent. Back crosses to the cultivated and desirable lines are also conducted when there are wide hybridization crosses. On the F6th, an advanced observational trial is conducted for yield, followed by preliminary yield trial on the 7th generation, general yield trial on the 8th generation and selected lines are entered in the National Cooperative Tests (NCT). For the irrigated lowland rice, there are 6 sites for the first NCT. Any desirable lines are advanced to the second NCT with 22 sites. For other ecosystems, there are 5 sites for saline testing, 7 for rain fed and 6 to 8 sites for hybrid rice. In all ecosystems, the yield, resistance to major pests and diseases (green leafhopper, brown plant hopper, stem borer, tungro bacterial blight, blast sheath blight, and blast) and grain quality are assessed.