# Biotechnology for Sustainable Agriculture Development

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The challenge of the Indonesian Agricultural biotechnologist is how to overcome the problems due to population growth and booming of all kind of industries. The crucial problems are (1) increasing demand of food, clothing and housing, (2) decreasing of fertile agriculture land, (3) scarcity of fresh water, (4) increasing of waste and polluted environment, and (5) rules of patent, environmental management, biosafety and food safety. In the year 2020 the predicted population and rice consumption in Indonesia will be 288 million people and 42.3 million ton, respectively.

The increasing of population and percapita income (US$3500/in year 2008) create the biggest market in Indonesia especially for agricultural and agricultural related products. The market is also increasing due to open up sub regional free market (AFTA/2003), regional free market (APEC/ 2010) and world market (2020). The increasing of market demand, development of science and technology, regional and international cooperation are all the opportunity for the Indonesian sustainable agricultural biotechnology development.

The role of biotechnology for development of sustainable agriculture is to (1) explore indigenous biological resources (microorganism, plant, and animal ) and (2) to initiate development of new strains, varieties, breed of microorganisms, plant and animal with a better performance, productivity and genetic ability.

Sustainable agriculture is simply a long term viable agricultural system that is (1) ecologically sound, (2) economically viable, and (3) socially just and (4) ethically humane and peaceful. This type of sustainable agriculture fit both the developed countries as well as developing countries.

The vision of sustainable agriculture towards the year 2020 is to develop viable agriculture and agroindustry based on agrobiotechnology and agribusiness. Therefore the mission of biotechnology for sustainable agriculture is to secure the survival of human being through the production of enough food, enough cloth, sound, safety and peaceful environment.

The strategy is to develop specific biotechnology fit to the sustainable agricultural system in Indonesia such as multiple cropping system, minimum tillage, and agricultural system of integrating rice and fish (mina padi) or fish and chicken (longjam).

The improvement of microorganism is to improve their genetic ability as an agent of conversion of agricultural products and agricultural waste to more useful products, biopesticides, and biofertilizers. The breeding of crop, animal and fish must be locally specific and system specific, least input and self reliance plant (LISRP), animal (LISRA), and fish

(LISRF). The biotechnology development has to be aimed mainly for the small and medium scale farmer rather than the big companies.

Apometic or clonal seed will be the new green revolution, social revolution in agriculture and a farmers friend. Apometic gene will stabilize the hybrids cultivar, maintenance of heterozygous, clonal propagation directly from seeds and elimination or reduction of propagul borne disease. Apometic gene can be derived from artificial mutated gene of *Arabidopsis thaliana,* isolated, clone and transfer to the target crops. Biotechnology of apometic must be programmed as a national biotechnology project for Indonesia.