Crop improvement and biotechnology in Cambodia

Ty Channa
Training and Information Center, Cambodian Agricultural Research and Development Institute (CARDI), Phnom Penh, Cambodia

Introduction

Cambodia is still emerging from an extent period when the agricultural production and support system was severely degraded. Agriculture is the fundamental sector of the Cambodian economy and is a top priority for development programs (May, 2001). Over the period 1993-2001, agriculture was the major sector of the economy, the contribution of GDP is an average of 46.4 percent of total GDP in Cambodia (MAFF, 2003). However, current public investment in agricultural research constitutes a relatively small portion of the total Cambodian government budget because of resource constraints (MOP, 1999). The research programs have been conducted based on the priority needs of the country arid the availability of a budget provided by the government and international assistance.

Crop production

Cambodia is predominately a rural economy with over 80% of the population living in rural areas (UNFPA, 1998, MOP, 1998) and most of them are farmers (MRD, 1999, FAO, 1999). There is considerable scope for expansion in the area under agricultural production and for increases in productivity (Nesbitt, 1999). Cultivation of most crops has still not recovered from the war years leading up to 1993. Few cropping areas have reached the size of those of 38 years ago (Table 1). Yields have increased slightly for the most crops with the introduction of improved technology. The significant increase was notified in rice crop with about double yield and production. The increase in rice production during the past decade was mainly due to the efforts in research program leaded by the Cambodia-IRRI-Australia Project (ClAP) in collaboration with the Department of Agronomy and Agricultural Land Improvement (DAALI).

However, when the Cambodian Agricultural Research and Development Institute (CARDI) was formally established as a semi-autonomous institute in August 1999, it has inherited an on-going research program from CIAP, mainly concerned with rice production and other agricultural commodities such as vegetables, fruit trees and ect.

Table 1. Crop areas, yields and production in 1967 and 2005 in Cambodia

Corp	Planted area (ha)		Yield (t/ha)		Total Production ('000 t)	
	1967	2005	1967	2005	1967	2005
Rice	2513.8	2443.5	1	2.4	2,457.0	5,986.1
Maize	117.0	90.7	1.3	3.5	149.0	247.7
Mungbean	48.0	60.5	0.5	0.8	25.0	45.0
Soybean	8.1	118.7	0.9	1.5	7.3	179.0
Sweet potato	1.4	8.4	9.1	4.6	12.8	39.1
Cassawa	2.1	30.0	10.9	17.8	23.0	535.6
Peanut	22.8	17.2	0.9	1.4	20.8	22.6
Tobacco	17.4	8.1	0.6	1.7	10.1	14.1
Sugar cane	5.0	5.9	25.6	19.7	128.0	118.1
Sesame	14.0	79.2	0.6	0.8	8.4	56.7
Jute	8.7	0.5	1.9	1.6	15.0	0.8
Vegetables	43.0	35.7	10	4.8	430.0	172.3

Source: Tichet, 1981; MAFF, 2006.

Crop improvement

Current crop improvement in Cambodia bases on (i) conventional breeding, (ii)introduced improved varieties and (iii) grafting.

Conventional breeding: the improvement using a conventional breeding method is mainly applied for the development of rice varieties. Mass selection, pure-line selection and a conventional crossing are commonly applied (Ouk *et al.,* 1995; Men *et al.,* 2001). The first two methods are used to exploit the best traditional rice varieties for their broadly adaptability in Cambodian conditions. All generated crosses involve at least one traditional rice variety as parent. Grain yield, maturity, grain quality and tolerance to drought and submergence are the variables considered for selection.

Introduced improved varieties: this method is applied for most of the crops, particularly for vegetables.

Grafting: is applied for fruit trees and mainly for mango

Biotechnology in crop improvement of Cambodia

The lack of resources provided by the government to establish research infrastructure and activities and the limited human resources lead to slow progress in research technology. Although biotechnology has significantly augmented the conventional crop improvement and has a great promise to assist plant breeders to meet the need for greater crop productivity, enhancing resistances to biotic and a biotic stresses and improved agronomic traits, the crop biotechnology and its research have not been applied in Cambodia. The important role of biotechnology for crop improvement and the crop production demand in the nearly future will force Cambodian plant breeders to apply this technology. Therefore, there is a need to establish a well-equipped laboratory at a national level and well-trained persons in the fields of molecular biology and biotechnology, which would require international assistance.

In contract, the rejection by consumers in Europe of foods derived from genetically modified (GM) crops (Preston, 2001) highlights a need for capacity building in Cambodia in the field of bio safety, regulation and law to rule the use of biotechnology and its products introduced from other countries.

However, in early of 2004 the Cambodian Agricultural Research and Development Institute (CARDI) has established with well-equipped laboratory. At the beginning of biotechnology development, the institute has started in doing with a Tissue Culture on Banana plants.

Government's Policy on Biotechnology and Biosafety

The Royal Government of Cambodia will continue to push for the integration of Cambodia into the region and the world, especially focusing on bridging the development gaps in advanced agricultural science and technology. Therefore, the Government set up a policy on biotechnology and biosafety as below:

1. Use of biotechnology to reduce the use of chemicals.
2. Use of biotechnology to control pollution and to improve environmental health and other aspects of environment.
3. Provide capacity for monitoring and enforcement to concerned ministries, NGOs and universities.
4. Build capacity in appropriate labs in Cambodia to be able to identify LMOs.
5. Utilize biotechnology to produce protein rich products that could be used as animal feed, organic fertilizers, soil conditioners and soil stabilizers.
6. Promote sound genetic manipulation to increase fish and crop production.
7. Promote the production of biogas, bio-fertilizers, and energy as a by-product of fermentation processes.
8. Establish a national directory of human resources working on subjects concerned with biotechnology and biosafety.

9. Develop a biotechnology training program including risk assessment and risk management of LMOs.
10. Increase university resources in biotechnology research and development.
11. Include in the educational curricula the conc ept of genetic diversity, its importance and application in genetic engineering and technology.
12. Develop a National Code of Ethics and Guidelines for the use of biotechnologies, LMOs and GMOs. (NBSAP, 2002)

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