Experience in the Development and Commercial Use of Agricultural Biotechnology in China

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China is the most populated and one of the largest agricultural country in the world, with only about 7% of the world's cultivable land feeding over 20% of the world's population. With the rapid increase of the population as well as dramatic decrease of the cultivable land, food security for the people is highly concerned. Chinese scientists, for many years, have been taking great efforts to improve the crop yield by traditional breeding techniques, e.g. breeding the hybrid rice which made a great contribution to the agriculture production. From 1983, with the development of transgenic techniques, more and more transgenic plants were obtained and the agricultural biotechnology has been becoming a powerful tool for improving agriculture production. In 1997, China started to commercialize transgenic crops and eighty thousand hectares of transgenic crops (including mainly insect-resistant Bt cotton, Bt corn, virus-resistant sweet pepper and tomato etc., Table 1) were planted in 1998 and will reach approximate four hundred thousand hectares in 1999.

Table 1 Commercialization and Field Releases of Transgenic Plants in China

Commercialization		Field Releases	
B.t. Cotton, insect-resistant	CAAS Monsanto Co.	Rice Potato Soybean Tomato Sweet pepper Poplar	Tobacco Corn Orange Eucalyptus Oil-rape
Tomato, virus-resistant	Peking Univ.		
Tomato, shelf-time altered	CCAU		
Petunia, flower-colour-altered	Peking Univ.		
Sweet pepper, virus-resistant	Peking Univ.		

From 1986 on, with supports from National 5-year Plannings, National High Tech Planning, National Natural Science Foundation and other biotech projects from Ministry of

Agriculture (MOA), over one hundred laboratories in China were involved in transgenic plants research. My lab released TMV-CP and CMV-CP transgenic tobacco and tomato plants into fields for testing virus-resistance in 1990. In 1996, MOA established the Office of Genetic Engineering Safety Administration (OGESA) to regulate field test, environment release and commercialization of transgenic organisms. In 1997, 4 commercialization licenses were granted and 41 field tests out of 55 applications were approved by the OGESA, while 7 applications were pended. In 1998, pending 16 applications, 2 commercialization licenses were granted and 49 field tests out of 68 applications were approved. By June of 1999, the six licensed transgenic plants, three of which were granted to my lab (table 1), were approved to plant in another 20 different locations throughout China for commercialization while 42 field tests have been approved (see table 2).

Table 2 Releases and Commercialization of GMOs in China

	Applications	Commercialization	Environmental releases	Field Trials	Pending
1997	55	4	31	10	7
1998	68	2	10	39	16
June,1999	73	20 (different locations)	18	24	11

Data from the Office of Genetic Engineering Safety Administration, Ministry of Agriculture

Biosafety of transgenic food has been a hotspot all over the world. In China, the public generally accepts commercialization of transgenic plants and most people believe that the agrobiotechnology is a powerful tool for promoting agricultural production and provide enough food for the people on the earth especially those in populated developing countries in the future. The government had been paying much attention to it so that agribiotechnology will be safely used to help tackling the food security problem. Many measures have been taken when conducting transgenic plants field trials, e.g. careful planning and fields selection including the consideration of wild species around and etc. Pollens of transgenic plants had been widely collected and tested for possible gene flows. In 1995, supported by EU, Professor R. Casper from Germany led an EU delegation to China to evaluate the biosafety status of transgenic plants in the fields. They went to several locations in Henan and Liaoning Provinces to collect samples of transgenic plants

and came to the conclusion in the end that transgenic crops behave normally and no mutated virus was found in our transgenic crops after five years of field releases. In my lab, experiments on evaluating the safety of transgenic tomato and sweet pepper had been conducted, strictly according to the standard procedure. The results showed no significant difference between rats fed with GM products and those with normal diets in growth rate, food consumption coefficiency, blood systems, function of livers and kidneys, reproductive systems as well as the metabolism of protein, fat and sugar.

However, because some countries have different opinions on the safety issue of transgenic foods, the application of agribiotechnology has been largely retarded, although a large number of safety tests had been and still being carried out confiming the safety of transgenic products as food. An international harmonization should be reached since lackness of this harmonization will bring up international conflictions on import and export of agricultural products, which will indirectly block the development of transgenic technology. It is reasonable for us to believe that within the next ten years agribiotechnology will help the whole world completely resolve the problem of food shartage.