

## Management of Field Testing of Transgenic Plants: Thailand Experience

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### Abstract

The development of biosafety guidelines in Thailand began in 1990 and the drafting of Biosafety Guidelines was completed in June 1992. The Guidelines which have been published and circulated among research institutes deal with laboratory practices and the releases of GMOs into the environment. The National Biosafety Committee (NBC) was established in January 1993. It was also strongly recommended that an Institutional Biosafety Committee (IBC) be established at various universities, government departments, research institutes, regulatory agencies as well as private agencies.

There have been a number of applications or requests for field trials of transgenic materials from many Transnational Companies. However, only a few cases have received approval for testing: (1) the field trial for the production of seeds of genetically modified tomato plants, Flavr Savr tomato of Calgene Company, in 1994 and 1995-1996, and (2) field testing of Monsanto *B.t.* cotton in 1996 under contained netted screen house.

The management of field testing of transgenic plants has been handled in cooperation with various research institutes. The IBC should be responsible for research work at the respective institutes in consultation with the NBC. The NBC is acting as "Technical Advisory Committee" of the Ministry of Agriculture and Cooperatives (MOAC) with the National Center for Genetic Engineering and Biotechnology (BIOTEC) as its secretariat. Therefore, the application for field testing should be sent to the Director General of the Department of Agriculture (DOA), MOAC, with a copy to the NBC. The NBC will, after careful consideration of the proposal, provide its recommendation to the DOA for final consideration and approval. The monitoring of field testing has been jointly carried out by the NBC and DOA through the sub-committee on the "Monitoring of Field Testing of GMOs", which includes field visits, progress and final reports.

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## Introduction

Thailand economy has been considered to show a high growth rate in Asia. With its success in agricultural development coupled with rapid agro-industrial development, the country could maintain her lead in the world export of many agricultural commodities. Thailand is currently the world leader in the export of rice, cassava products, canned pineapple, canned baby corn, and ornamental flowers (orchids). Thailand also ranks among the top producers and exporters of tropical fruits, rubber, frozen shrimp, canned sea food, fruit juice, and other products. The success could be attributed to its strong support in research and development, especially in the field of crop variety and animal breed improvement.

Realizing the potentials of biotechnology in improving a broad spectrum of industries, human health and environment, the National Center for Genetic Engineering and Biotechnology (BIOTEC) was established in 1983 and later joined the National Science and Technology Development Agency (NSTDA) in 1991. With its responsibility for supporting and carrying out R&D in the area of genetic engineering and biotechnology, progress has been made in many fields such as fermentation, tissue culture and micropropagation, as well as the application of rDNA in improving useful strains of microorganisms, plants and animals. Such development, however, has been carried out with a great concern about the safety at all levels.

## Development of biosafety guidelines

With the awareness on possible adverse effects of novel organisms resulting from genetic engineering on human health and environment, the biosafety guidelines in Thailand had been developed. After the review of the status report on the prospects of biotechnology in agriculture earlier commissioned in 1986, BIOTEC (formerly known as NCGEB) commissioned another feasibility study on biosafety in 1990. As a result the Biosafety Subcommittee was established under the BIOTEC in that year and the Ad Hoc Biosafety Subcommittee was appointed in April 1992 with the responsibility for drafting the Biosafety Guidelines. The draft was completed in June 1992. The National Biosafety Committee (NBC) was established in January 1993. The establishment of the Institutional Biosafety Committee (IBC) at various research institutes was subsequently promoted. Through many workshops/training courses involving researchers from different government agencies, the understanding of concern about biosafety has improved. As a result many universities and government research institutes have established their own IBC.

## Implementation of guidelines

The NBC is responsible for implementing the biosafety guidelines with BIOTEC as its secretariat. A subcommittee on plants has been established to provide inputs to IBC on field testing of transgenic plants. Research institutions, mainly universities

and concerned departments, have been informed of the existence of the NBC and mode of operation. Seven out of twenty research institutes have established Institutional Biosafety Committees (IBCs) with a close linkage with the NBC. The procedures for obtaining permission for the introduction and field testing of transgenic plants are shown in Figs. 1 and 2.

Fig. 1 illustrates the steps involved in seeking approval for the introduction of the transgenic plants (seeds) into the country. Since the DOA enacted a "Ministerial Declaration" under the "Plant Quarantine Act" and that no transgenic plants can be introduced into the country, unless permission is granted by the Director General (DG) of DOA and only for experimental purposes, the applicant has to seek this permission as the first step. All relevant information and documents concerning the transgenic plants (nature of genes, gene constructs, transformation process, etc.) have to be submitted to the DOA DG with a copy to BIOTEC (as NBC secretariat). NBC will consider the case and give recommendation to the DOA DG for final consideration. The case may be approved or rejected depending on this joint DOA-NBC consideration.

Fig. 2 illustrates the steps involved in the approval of field testing of transgenic plants. In fact it is a continuing process after the introduction of transgenic plants into the country. Using the same documents as those shown in Fig. 1, NBC will consider a detailed proposal to test transgenic plants in the field. If the proposal is sound, NBC will give recommendation to the DOA for approval. If not, NBC will hold discussions with the applicant about points to be corrected. At the same time the DOA has its own IBC to consider the case. Finally the opinion from both committees will be collected and decision made by the DOA DG to approve or to reject the field test.

## Monitoring of field tests

There have been only two cases of field testing of transgenic plants in Thailand. The first case was the Calgene Flavr Savr tomato and the second--the Monsanto *B.t.* cotton.

## Calgene Flavr Savr Tomato

In 1993 Calgene Fresh Company made a request to conduct a field test on seed production of genetically engineered Flavr Savr tomato in Thailand. The proposed parental lines had all been tested in the US under the authorization process that was later relaxed to a notification process for tomato and 5 other crop species (APHIS, 1993). The NBC at the time considered the case in accordance with the biosafety guidelines and with some conditions. It was specified that the company had to work with a local company with a plant pathologist from a university as an expert and collaborator. And since it was the first case, the testing had to be carried out under a strictly contained environment, a netted house to prevent insect pollination. The permission

was granted in 1994 and it was the only case of field testing of transgenic crop in the country. In 1995-1996, this Calgene Flavr Savr tomato was approved for field testing again, this time in an open field in the northeastern part of the country.

### Monsanto *B.t.* Cotton

The application to field-test this *B.t.* cotton was made in 1995 and it took some time for the NBC and DOA IBC to grant permission. Since the case involves genes producing toxic substances (proteins) that could kill certain groups of insects, careful consideration had to be made. Finally, it was recommended that the *B.t.* cotton had to be planted in a netted screen house to protect insects. Tests will be carried out also for the survival of beneficial insects under the same containment conditions as for the *B.t.* cotton.

The experiment was performed in the Northeast areas at the beginning of March 1996 and will continue until the end of June. Tests are being conducted by placing the target insects and beneficial insects (separately) into the screen house. Insect counts are being made in order to confirm the effectiveness in the control of the target insects and the absence of risk to beneficial insects.

Both experiments enabled the NBC to learn how to carry out field testing and monitoring as well as to promote coordination among concerned agencies. The lessons learned from the cases were used in improving the coordination system in the country. At present the NBC has been acting as the technical advisory committee of the Ministry of Agriculture and Cooperatives (MOAC) and BIOTEC as its secretariat. All legal matters fall under the responsibility of the MOAC and BIOTEC coordinates the implementation of biosafety guidelines.

In order to develop an effective system in monitoring field testing, the DOA has established a "Joint Working Group Committee" to monitor the field testing of transgenic plants. Experts from DOA and from NBC join hands in considering the design of experiments, field visits, provision of recommendations including post-harvest practices. For example, in case of the Flavr Savr tomato experiment, 4 field visits were made before harvest and additional 4 visits are scheduled after the harvest. Progress reports and final report on field testing are required and will be reviewed by DOA, IBC and NBC.

### Concluding remarks

At present biosafety regulation in Thailand consists of a flexible law with voluntary guidelines. The only part that is linked to the existing Plant Quarantine Law is the control on the import of all transgenic seed crops into the country. Such imports need

approval from the MOAC and are allowed for the purpose of experimentation only. Thailand is in the process of improving the productivity of all economic sectors and biotechnology application is crucial for such development. The balance between R&D and regulatory aspects is very important .

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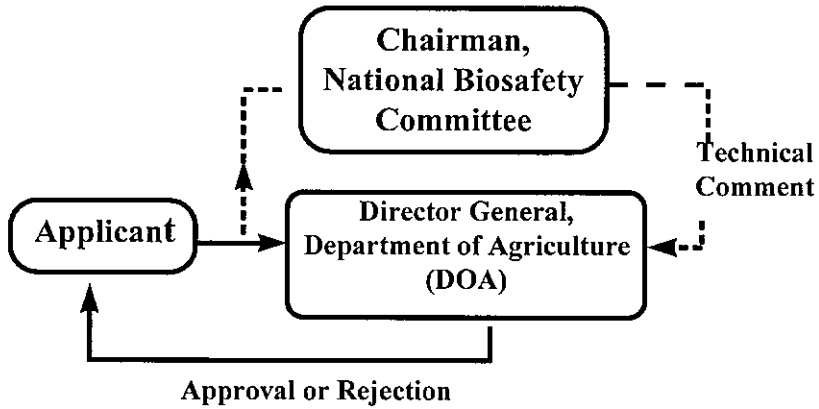


Fig. 1 Regulatory framework for the introduction of transgenic plants into the country

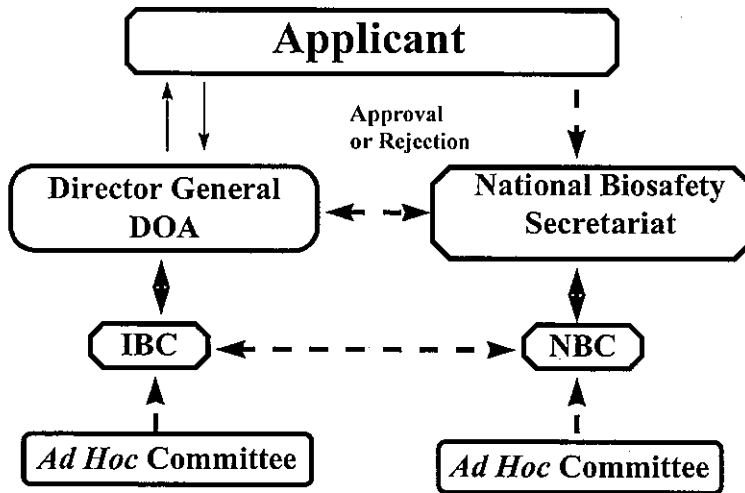


Fig. 2 Collaborative arrangements for the approval of field testing of transgenic plants