

# Background and objectives of the workshop: Ecological Risk Assessment for the Gene Flow from the Genetically Modified Crops

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## Abstract

The objectives of this workshop is to discuss information that the present situation of the research on the gene flow from genetically modified (GM) crops, particularly for rice and soybean which are important crops in Asia. This workshop targets setting the background for more in depth discussion on ecological risk assessment for GM rice and soybean cultivations by identifying key factors such as gene flow and introgression, frequencies and factors affecting them. Gene flow and introgression is a particularly complex subject, and estimating a frequencies requires great deal of information (Lentini, 2006). Understanding the potential for adverse ecological effects from genetically modified organisms and the characterization of associated risks depends not only on quality of biosafety research but also on going interaction between risk assessors, regulators and researchers (Schiemann, 2006). So, we will attempt to form an international network centered on Asia.

**Keywords:** Gene flow, GM rice, GM soybean, biodiversity, ecological risks

## 1. Introduction

The global area of approved GM crops in 2005 was 90 million hectares up from 81 million hectares in 2004. The increase was 9 million hectares equivalent to an annual growth rate of 11% in 2005. These GM crops were grown by approximately 8.5 million farmers in 21 countries in 2005, up from 8.3 million farmers in 17 countries in 2004. In Asia, GM cotton were planted by 3.3 million hectares in China and GM maize were planted 0.1 million hectares in Philippine. In Iran, GM rice (*Bt*) was officially released in 2004, and was grown on approximately 4,000 hectares in 2005 by several hundred farmers. And they initiated commercialization of GM rice and produced supplies of seed for full commercialization in 2006. Rice is one of the most important food crops in the world, cultivated by 205 million farmers. China and Iran are the most advanced countries in the commercialization of GM rice (ISAAA, 2005).

In Japan, 88 kinds of GM crops of which Type 1 Use Regulation (the use of living modified organisms without preventive measures against their dispersal into environment) is approved under the Cartagena Protocol domestic Law since 2004 (J-BCH, 2006). Major GM crops are maize (*Bt*, *HR*, *Bt+HR*), cotton (*Bt*, *HR*, *Bt+HR*), rice (*resistant to rice blast and bacterial leaf blight*, *semi-dwarf* etc.), and soybean (*HR*). However, no GM crops have commercially cultivated.

## 2. GM farming and gene flow

Gene flow mediated by pollens is found through nature in plants. However, when various GM crops cultivate in fields, it will raise concerns about the adverse effect on biodiversity and mixing of seeds in same crops through hybridization depending on the kind of crops and transgenes.

There are two types of gene flow. One is "Horizontal gene flow" which is the movement of genes between unrelated species, e.g. between plants and microbes. Another is "Vertical gene flow" which is the gene exchange between closely related species usually through sexual hybridization mediated by pollens. And "Vertical gene flow" is divided into two types according to pollen recipients, that is crop-to-crop and crop-to-wild relative (Lu, 2006). For example, the case of "crop-to-crop" is the transgene moving from GM soybean to conventional soybean, and the case of "crop-to-wild relative" means the movement of transgene from GM soybean (*HR*) to wild soybean, *Glycine soja*, and which will accordingly acquire the tolerance to certain herbicide.

In this workshop, we will focus the second type of gene flow, "Vertical gene flow" in rice and soybean. Rice has anemophilous flowers and soybean has entomophilous flowers. However, both crops show high self-compatibility and well known for low out-crossing rate.

## 3. For the establishment of international network centered on the Asia

Our aims in this NIAES International Workshop are to address the present situation on the study of gene flow from GM crops, particularly for rice and soybean which are important crops in Asia and both crops have wild endemic relatives in Asia. We have the common background to the argument about GM crop cultivation and it is meaningful to discuss collaborative initiatives towards establishing international networks for agro-environmental research.

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