

## Genetically Modified Organisms (GMOs): Issues, Policies, and Impact on Agricultural Economy

More popularly known as GMOs, genetically modified organisms, according to experts, are organisms in which the genetic material (DNA) has been altered from natural processes. The technology is often called “gene technology” or “genetic engineering”. While modern countries, especially the United States, China, Australia, Canada and the European Union have long been using genetic engineering in the production of crops (refer to Table 1), the Philippines has yet to fully adopt genetically modified organism technology in enhancing yield, variety and quality of crops in the agriculture sector. In spite of some perceived advantages such as improved crop protection, lower product price, greater nutritional value, higher yield, among others, there has been strong opposition especially from the religious and environmentalist groups to government’s move to implement the use of GMOs in the country. According to these groups, while genetic engineering promises many advances in agriculture and medicine, this also poses great ethical and biological dangers, risks and uncertainties. They further argue that GMOs are risky for consumers since it may trigger health hazards such as allergies and toxin-related diseases. Some environmental issues such as the detrimental effect on beneficial insects or a faster induction of resistant insects, the potential generation of new plant pathogens, the detrimental consequences for plant biodiversity and wildlife, and a decreased practice of crop rotation, are currently the focus of scientific investigations. These same compelling issues continue to hound the Department of Agriculture (DA) since the safety and acceptability of GMOs related to economic, health, moral and environmental impact are a

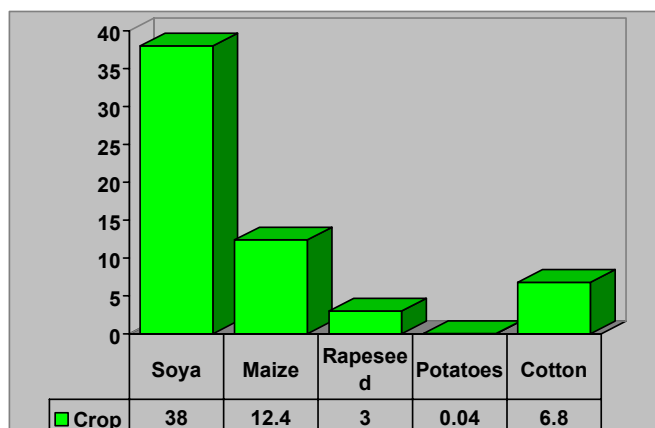
paramount concern to consumers, small farmers and fisherfolk as well.

**Table 1. Area Sown to GMOs, by Country, 1998-2002**

Country	In 1000 ha				
	1998	1999	2000	2001	2002
European Union	22	12	31	30	25
USA	20800	28700	30100	35700	39000
Argentina	1500	3500	5800	11800	13500
Canada	2800	4000	2500	3200	3500
China	1100	300	500	1500	2100
Brazil		1200	1400	1400	1500
Chile		310	10		
India	0	0	0	0	<0.1
Mexico	50	50	30	<0.1	<0.1
Australia	300	100	200	200	100
South Africa	60	180	200	200	300

Source: European Commission, Directorate-General for Agriculture and ISAAA

**Figure 1. Area Sown to GMOs, by Crop Selected Countries Worldwide, 2002 (in M hectares)**



Source: European Commission, Directorate-General for Agriculture and ISAAA

## Government Policies on GMOs

In October 1991, the National Bio-Safety Committee of the Philippines (NBCP) was established by way of Executive Order No. 450 as the highest regulatory body with regard to the introduction, use and transfer of GMOs and Potentially Harmful Exotic Species (PHES) in the Philippines. The NBCP, where the DA is a member, is mandated to undertake the study and evaluation of existing laws, policies and guidelines on biotechnology and recommend measures for its effective utilization and prevention of possible pernicious effects on the environment. The NBCP has already issued two guidelines relevant to proper handling, propagation and other protocols that cover GMOs. The first one was issued in 1991 and covers primarily the importation, transport, and contained use of GMOs. The other one, in May 1998, covers the planned release of GMOs into the environment.

The 1991 Guidelines established several criteria for evaluating work on GMOs under containment or laboratory control. These include transformation protocol; genetic and physiological analysis of the donor organisms and GMOs; adequacy of the facility and laboratory to ensure that no viable genetic material escapes; and, the proper disposal of used materials from the experiment. On the other hand, the 1998 Guidelines established the criteria for evaluating the planned release into the environment or field-testing, of GMOs. It specifically excludes from its coverage work done in laboratories and greenhouses; accidental releases from contained facilities; pharmaceutical, processed food, animal feed and other products which are already being regulated by other agencies of government; and work involving organisms which result from natural reproduction or the use of traditional breeding practices. The Guidelines covers both GMOs and potentially harmful exotic species.

In supplementing efforts to ensure the safety of the environment from the possible effects of GMOs, President Gloria Macapagal-Arroyo, in July 2000, approved the Philippine Policy Statement on Modern Biotechnology, which “promote[s] the safe and responsible use of modern biotechnology and its products as one of the several means to achieve and sustain food security, equitable access to health services, sustainable and safe environment and industry development; and

ensure that the use of modern biotechnology will provide opportunities to increase productivity and incomes of farmers and fisherfolk, enhance the welfare of consumers, and generate efficiency, competitiveness and improved quality standards of local industries, with the paramount objective of ensuring human and environmental safety and sustainable development.”

More recently in April 2002, the DA issued Administrative Order No. 8, or the policy framework for the risk assessment of plant and plant-based products derived from modern biotechnology, which are entering the country. Also known as Rules and Regulations on the Importation and Release into the Environment of Plant and Plant Products Derived from the Use of Modern Biotechnology took almost three years to craft, after extensive consultations.

Under said guidelines, DA conducts tests to determine the safety of plant and plant products for release into the environment through either field-testing and propagation, importation of food products, feeds, or processing.

The main regulatory agency for said provisions is the Bureau of Plant Industry (BPI), which has the mandate over plants and products, whether derived using modern biotechnology or not. The BPI is assisted by other regulatory agencies such as the Bureau of Animal Industry (BAI), Bureau of Agriculture and Fisheries Products Standards (BAFPS), and the Fertilizer and Pesticide Authority (FPA), and is guided by a scientific and Technical Review Panel, an independent body of scientists which does risk assessment on bio-engineering technology and products.

## The First Genetically Modified Crops in the Philippines

The Philippines is the first country to allow the first biotech food crop to be commercially planted in Asia. Governed by the aforementioned set of guidelines, the DA approved in December 2002 the propagation and importation of Bt corn—the first genetically modified crop approved for field-testing in the country.

Bt-corn is a variety of corn where a specific gene of *Bacillus thuringiensis* (*Bt*), a common soil bacterium used safely since the 1950s by organic

gardeners and farmers worldwide as biological insecticide, is inserted to produce a protein that protects the corn plant from Asiatic corn borers, the number one enemy of corn. This pest infestation causes up to 80% yield loss as borers feed on the stem, leaves, and corn ears even before the crop matures.

DA further claims that Bt corn may increase corn yields by as much as 40%<sup>1</sup>, and reduce production costs (including labor costs) by eliminating the need for commercial pesticides. Thus, Bt-corn gives promise of better incomes for corn farmers, poverty reduction in rural areas, and enhancement of the country's self-sufficiency in corn. From 1996 to 2002, Bt corn has been planted in almost 44 million hectares around the globe and has the potential to increase corn production up to 35 million MT per year (5% increase in temperate maize growing areas and 10% in the tropical areas).

In the Philippines, Bt corn is now planted in about 20,000 hectares of land and is expected to reach 30,000 ha before the year ends. (Agri-food News Archive, Philippine GM-Corn Experience). The country has 2.5 million hectares of total corn area. Dr. Artemio Salazar, GMA Corn Program director of the DA, has predicted that the corn yield could rise to more than five million tons this year from 4.6 tons in 2003 (Pablico, The Manila Times-May 2004). So far, the provinces for field tests and commercial production of Bt corn are Isabela, Pangasinan, Camarines Sur, Bukidnon and South Cotabato which chalked an average yield of 7.3 metric tons per hectare.

Notwithstanding the benefits from Bt corn and the positive experience with GM crops of developing countries, oppositors to the technology insist that GM crops run against the natural evolution of crops and have not yet been proven as safe to humans and the environment. Furthermore, they fear that once GMOs are released to the environment, their possible harmful effects would be irreversible. In addition, they argue that GM crops will foster dependence of farmers on the multinational companies that produce the seeds.

Although highly unpopular among some environmentalists and consumers, a clearly defined scientific basis to declare Bt corn as unsafe has to be established. DA argues that it has conducted thorough testing for toxicity, allergenicity and nutritional food and feed values. Moreover, more than 50 international organizations, including the Food and Agriculture Organization (FAO), declared GM crops, including Bt corn, as safe and non-threatening to humans and the environment (Manuzon, Philippine Business Magazine Vol 10. No. 6).

As a safety net for the farmers and the consuming public and to allay fears on the possible proliferation of GM products, DA imposes a screening mechanism by requiring importers to declare if raw materials to be shipped to the country contain GMOs. Sometime mid-2003, the application of multinational agro-chemical company Monsanto for the field trial of soybean, one of the country's major imports, was approved by the DA. One positive feature of Monsanto's Round-up Ready soybean is its resistance to weed round-up. Fifteen (15) more GMO applications have been filed since DA began imposing stricter policies.

### **Status of GMO Approvals**

According to data from the Bureau of Plant Industry (BPI) which monitors importation of GMOs, there were 16 plant and plant-based genetically altered products approved (as of December 22, 2003) for importation, for direct use for food, feed or processing in the country (see Table 2).

### **Current Policy Efforts**

The DA-Biotech Program supervises the policy researches on biotech development in the Philippines. Recently in 2004, it launched an inventory of policy research projects zeroing-in on the biotech priority areas, prospects, bio-safety, intellectual property rights, socio-economic evaluation and policy analysis of the commercialization of GM technology. The following are recommendations on the major policy research areas:

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<sup>1</sup>This claim was verified by an impact assessment study conducted by the STRIVE Foundation over the two seasons of multi-location testing of Bt corn in the Philippines, during the wet season of 2001 and dry season of 2002.

- a) *Biotech Priorities and Policies in the Philippines.* There is a need to build up databases of international regulations and agreements on diseases relating to the livestock industry. It is also important to touch base with the BAI and the local government units in terms of identifying livestock production areas within the country that are affected by major animal diseases;
- b) *Funded Policy Development Studies on Biotechnology.* A broader impact study should be undertaken to look at the adoption of Bt-corn crops by farmers;
- c) *Cost Implications of GM Food Labeling in the Philippines.* Labeling should be undertaken if there is a change in the protein and composition. It is also important to clarify whether labeling should proceed from the consumer's right to know and/or to defer fraudulent practices that affect health safety. Identify the mechanisms for redress on the part of consumers if there are health hazards. The implication of the price difference between GM and non-GM products should be studied on a cost and net benefit analysis; and
- d) *Institutional Analysis of Biotech Development in the Philippines.* More focus is needed in the formulation of the National Bio-safety Framework (NBF), the sources of information as regards the stakeholders involved with non-negotiable positions (e.g. civil society groups that are against biotechnology), the mandate of the National Committee on Bio-safety of the Philippines, and the role of DENR and DA in the conduct of risk assessment.

sustainable food security, it was not remiss in taking on the task of promoting the safe and responsible application of modern biotechnology in the country.

**Table 2**  
**Approval Registry for the Importation of Regulated Articles for Direct Use for Food, Feed or Processing**

Transformation Event <sup>2</sup>	Introduced Trait and Gene	Technology Developer
Corn MON 810	Resistance to corn borer Cry 1A (b) gene from Bt	Monsanto Company
Corn Bt 11	Insect protected, herbicide tolerant maize-Bt protein and PAT protein from <i>Streptomyces viridochromogenes</i>	Syngenta Seeds
Soybean 40-3-2	Resistance to herbicide, round-up CP4 EPSPS from <i>Agrobacterium</i> sp. Strain CP4	Monsanto Company
Corn NK 603	Glyphosate tolerance imparted by the CP4EPSPS coding sequence	Monsanto Company
Corn MON 863	Cry3Bb1 for resistance to the corn rootworm, <i>Diabrotica</i> sp.	Monsanto Company
Corn TC 1507/CRY1F	Resistance to certain lepidopterous pests in Maize-Cry1F and PAT genes	Pioneer Hi-Bred
Corn DBT 418	Lepidopteran resistance, phosphinotritin tolerance-Cry1Ac	Monsanto Company
Canola RT 73	Glyphosate (Roundup) Tolerance-CP4EPSPS	Monsanto Company
Corn Bt 176	Insect protected-Bt protein and PAT protein from <i>Streptomyces viridochromogenes</i>	Syngenta seeds
Corn GA 21	Modified EPSPS for tolerance glyphosate	Monsanto Company
Corn DLL25	Phosphinotritin (PPT) herbicide tolerance specifically glufosinate ammonium-bar gene from bacterium <i>Streptomyces hygroscopicus</i>	Monsanto Company
Corn T25	Phosphinotritin (PPT) herbicide tolerance specifically glufosinate-PAT gene from <i>Streptomyces viridochromogenes</i>	Bayer Crop Science
Cotton 1445	Tolerance to round-up herbicide-CP4EPSPS	Monsanto Company
Cotton 15985	Resistance to lepidopteran pests-Cry2Ab2 gene	Monsanto Company
Potato Bt 6 (RBBT02-06) and (SPBT02-05)	Resistance to Colorado potato beetle-CryIIIA	Monsanto Company
Potato RBMT 15-101, SEMT 15-02 & SEMT 15-15	Resistance to Colorado potato beetle; resistance to potato virus Y (PVY)-CryIIIA and PVPcp	Monsanto Company

## Final Remarks

The advent of modern technology through the application of biotechnology on plants is a positive and innovative step in accelerating agricultural development. When the Philippine government recognized, through the issuance of Executive Order No. 43 on October 15, 1990, the potential of modern biotechnology in improving people's lives and achieving

<sup>2</sup>Source: [www.bpi.da.gov.ph](http://www.bpi.da.gov.ph). Transformation Event refers to the integration of a transgene in the cell of the plant, as a result altering its natural make up. In the case of Bt corn, it refers to the unique insertion of the Bt gene into the corn's DNA.

The guidelines and regulations passed on by the different government and private entities working on the effective adoption of GMO technology in the Philippine setting, are manifestations of government's dynamic efforts in safeguarding the risks posed by these technological booms to human health and environment.

In spite of the long-ranging benefits that have been enumerated, and the assurances given by numerous institutions and advisory groups—including the FAO—regarding GM crops being safe and non-threatening to humans and the environment, non-governmental organizations and religious camps continue to advocate their qualms.

A decade has passed since the passage of EO 43, and gains in agriculture have just begun to pick up in recent years. With adequate support and acceptance in technology transfer, hybrid rice (not the GMOs), for example, may slowly emerge as the next high-value crop. If these conglomerations are indeed initial signs of approaching a modernized agriculture and fisheries sector, various groups responsible for the AFMA reforms should get their acts together in rendering the necessary support mechanisms (not to mention the infrastructure and marketing aspect) that shall ensure that these modern technological efforts shall not be put to waste.

It is a basic economic fact that if technology (such as GMO) is introduced in the agricultural production, output increases and this create better income opportunities for agricultural workers. The income surplus flowing in the countryside will encourage private investors and banks to invest more and therefore improve credit accessibility. This cycle elevates to better results such as improved standard of living of farmers, and more credit channeled to better-earning agri-activities.

It would be premature to say whether GMOs are a blessing or a curse to Philippine agriculture. As front-liner in agricultural development, the DA should remain steadfast in balancing the two opposing sides. The government's implementation of its regulatory function over GMOs entering the country shall be a crucial factor in determining the success of this technology. For if this is not guarded, the Philippines may end up producing glut GM crops, which would be more detrimental in capturing the export market effectively.

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Your comments are valuable inputs to our future publications. Please call or write: Agricultural Credit Policy Council, 3/F Agustin I Bldg., Emerald Avenue, Ortigas Center, Pasig City. Tel. Nos. 6343320/21, 6363391 Website: [www.acpc.gov.ph](http://www.acpc.gov.ph)