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Socio-Economic and Political Concerns for GM Foods and Biotechnology Adoption in the Philippines

Liborio S. Cabanilla
University of the Philippines at Los Banos

The Philippines established the first National Institute of Biotechnology and Applied Microbiology in 1980. However, it was only in 2002 when Bt corn was first commercially introduced. Strong opposition by key sectors including the influential Roman Catholic Church contributed to this delay and will probably continue to affect the introduction of other GM crops in the future.

With favorable adoption rates of Bt corn, opposition dissipated and local scientific initiatives have expanded to other crops (e.g., GM papaya, eggplant). The Philippine Rice Research Institute in collaboration with IRRI is currently engaged in the adaptation of Golden Rice (biofortified for Vitamin A) but it is not clear how the polity will react to this new technology when it is ready for adoption. It is a major food staple in contrast to Bt corn. The government's agenda also puts a high premium on food self-sufficiency, especially rice.

Key words: biotechnology, GM food crop, biofortified crop, Golden Rice, Bt corn.

Introduction

In the Philippines, the concerns for growth, equity and sustainability provide the backdrop upon which arguments for or against the use of technological innovation in agriculture are commonly based. This is well documented in the case of the massive campaign to promote the Green Revolution in the 1970s. Militant groups then argued that the high-yielding rice varieties were exploitative of the poor because they require high inputs of chemicals and fertilizers, which are products of Western multinational corporations. To date, however, adoption of modern rice varieties has reached almost 100%.

The introduction of biotechnology, or the "Gene Revolution," over the past decade showed a similar argumentative pattern. Interest groups in the polity have expressed divergent views on biotechnology. A number of NGOs claiming to represent the interest of peasants and the environment have ardently opposed biotechnology, particularly genetic modification. The Catholic Church, a strong force in a country of more than 80% Catholics, has largely expressed apprehension about genetic modification. Apprehension has centered on its potentially deleterious impact on the environment, farmers' socio-economic well-being, and moral and ethical issues.

The Philippine government, however, has been supportive of the movement for the introduction of biotechnology. It recognizes its potential contribution to agriculture and public health. The establishment of public research institutions dedicated to biotechnology research in the 1980s was a first sign of the support for this new technology. Yet, commercial adoption of genetically modified crops only occurred in 2002 with the introduction of Bt corn. So far, the experience with this new variety has been positive.

Rice and corn play a strategic role in the government's effort to achieve agricultural and rural development. The promotion of technological innovation is a vital component of the government's strategy to achieve sustainable agricultural development. In this context, the past experience with regard to the Green Revolution in the 1970s as well as public perception in the Philippines must be taken into account in order to create public support for the sustainable introduction of biotechnology.

Important Milestones

The Philippines was among the first countries in Asia to recognize the value of Biotechnology (Padolina, 2000). In 1980, the National Institutes of Biotechnology and Applied Microbiology (BIOTECH) was established at the University of the Philippines at Los Banos (UPLB). BIOTECH's research has focused mainly on the use of the tools of biotechnology that do not involve transformation. Thus, products released to the market so far include biofertilizers and feed additives. In the 1990s, other biotechnology research institutes were established within the University of the Philippines (UP).

In 1987, a group of scientists from the UPLB, the International Rice Research Institute (IRRI), and

Department of Agriculture constituted themselves into an ad hoc committee on biosafety to ask the national government to formulate a national policy on biosafety and to create a technical body to draft guidelines to ensure that experiments using GMOs do not pose unacceptable risks to human health and the environment. This marked the beginning of a national effort initiated by scientists to introduce genetic modification in agriculture and, later, the medical sciences.

The National Biosafety Committee of the Philippines (NCBP) was formally institutionalized through Executive Order EO 430 in 1990. The functions of the NCBP were expanded under EO 514, issued in March 2006, and established the National Biosafety Framework (NBF). Section 2 of EO 514 specifically provides consistency with the Cartagena Protocol on Biosafety, and in particular, "the precautionary approach shall guide biosafety decisions."

The Administrative Order (AO) 008 Series of 2002, issued by the Department of Agriculture in April 2002, made commercial adoption of crop biotechnology possible. This order covered the *Rules and Regulations for the Importation and Release into the Environment of Plants and Plant Products Derived from the Use of Modern Biotechnology*. Bt corn was the first crop to be approved for commercial adoption in December 2002. Since then, four transformation events representing specific traits were approved, three of which are owned by Monsanto and one by Syngenta.

Government and Polity

The political and economic ramifications of biotechnology are viewed differently by various groups of the Philippine society, with each having different degrees of influence in policy making (see Aerni, Anwander Phanhuy, & Rieder, 1999, for the case of Bt rice).

Government

Under the administration of President Gloria Macapagal Arroyo, whose term lasts until 2010, biotechnology is high on the priority list of the government agenda. In July 2001, she issued the following policy pronouncement:

> "We shall promote the safe and responsible use of modern biotechnology and its products as one of several means to achieve and sustain food security, equitable access to health services, a sustainable and safe environment, and industrial development" (US Department of Agriculture [USDA]/Foreign Agriculture Service [FAS], 2005, p3).

The executive branches of government have instituted programs in support of the President's policy direction on biotechnology. The Secretary of the Department of Agriculture (DA) has recently announced a new national biotechnology program requiring a budget of 1 billion pesos (roughly US$20 million). The program will tap Philippine indigenous plant species for value-added processing into pharmaceutical, cosmetic, and food products (Aguiba, 2006). Likewise, the Department of Science and Technology (DOST) has organized its biotechnology program through its existing research councils.

The legislative branches (Senate and Congress) of government have a track record of being supportive of scientific innovations. Section 83 of the 1997 Agriculture and Fisheries and Modernization Act (Republic Act 8435) explicitly allocates 1% of agriculture's Gross Value Added to agricultural research. Although a few militant congressmen have expressed opposition to biotechnology, the Committees on Agriculture in both Houses have generally not been averse to biotechnology.

Intellectual property rights are amply protected. The Plant Variety Protection Act (Republic Act 9168) was enacted in June 2002. To date, no legal controversy concerning ownership has emerged. Instead, militant groups opposed to genetic modification mainly focused on the analogies to the earlier Green Revolution (Aerni et al., 1999).

Some local government units (LGU) have expressed opposition to GMOs and declared themselves as GMO-free zones. Among the first to make such a declaration is the island province of Bohol which, on July 21, 2004, passed Provincial Ordinance No. 2003-101. Otherwise known as the 'safeguard against GMOs,' this ordinance prevented the entry of GM plants, animals, and microorganisms into the province. News reports indicate that other provinces (e.g. Oriental Mindoro, Negros Oriental, and Negros Occidental) also declared themselves as "organic island of the Philippines" (Claparols, 2006). Greenpeace has been actively behind the campaign to convince LGUs to become GMO-free.

The Local Government Code (Republic Act 7160 of 1991) provides LGUs legal mandate to pursue programs independent from the national government. This is in line with the effort to devolve national functions (e.g. agricultural extension) to local governments. However, funding of key agricultural development programs (such

as those directly related to rice and corn self-sufficiency) remain with the national government. This has compelled local government units to align programs with those of the national government (Cabanilla, 2006a), which is a phenomenon that may prevent more provinces from following the decision of some island provinces declaring themselves GMO-free. Furthermore, unconfirmed reports indicate that farmers in such provinces that are eager to adopt biotechnology such as Bt corn smuggle in Bt seeds purchased from neighboring provinces.

Militant Groups

A number of NGOs in the Philippines oppose genetic modification, arguing that it poses great risks to the environment. Public protests were regularly staged by these groups between 2000 and 2001 when field trials of Bt corn were being conducted. In the forefront are militant groups that include *Kilusan ng Magbubukid sa Pilipinas* (KMP, literally translated as Peasant Movement of the Philippines); MASIPAG (acronym for Magsasaka at Sayantipiko Para sa Ikauunlad ng Agham Pang-agrikultura[1]), South East Asia Regional Initiatives for Community Empowerment (SEARICE), Greenpeace, and the Philippine Greens. During the field trials of Bt corn around the country, these groups staged regular protest rallies and hunger strikes. They also destroyed a number of the field trials conducted by Monsanto.

In Aerni et al. (1999, p.20) it was noted that NGOs are "not considered to be very important with regard to direct political decision-making processes, since they are not members of any legislative body." There is a new development in this regard. Currently, the militant groups have a formal backing from some members of the House of Representatives as a former chairperson of the KMP is now a congressman. Another congressman sympathetic to their cause has filed a bill for mandatory GMO labeling, but there are no strong indications said bill will soon be enacted into law.

Catholic Church

In a predominantly Catholic country, official pronouncements of the Catholic Bishops Conference of the Philippines (CBCP) exert a strong influence in policy making. To date, the CBCP has not issued a clear-cut and united stand on biotechnology. Based on available information, the CBCP says it has not supported biotechnology, contrary to government claims. This will remain so for as long as there is no official endorsement from the Pope. Conservative members of the CBCP, like Bishop Varela of Sorsogon, in the Southern part of Luzon Island, however, believe that GMOs can help provide a humane solution to the global problem of hunger and malnutrition.

This ambivalence on the part of the Church opened the way for the government, particularly the executive branch, to continue pushing for the adoption of biotechnology. It should be noted that during President Arroyo's visit to Rome on September 27, 2003, she apparently consulted Pope John Paul II about the Church position on biotechnology. On the basis of that meeting, she issued a statement indicating that she felt it was important that opponents of GMOs knew that according to the Vatican, GMOs are not immoral.

Other Coalition Groups

The Biotechnology Coalition of the Philippines (BCP) is a non-profit organization that advocates the safe and responsible use and advancement of modern biotechnology in the Philippines. Members include representatives from academia, farmer organizations, industries, church, media, and the scientific community.

Scientific Community. There are more than a dozen university research institutes that get funding from the government's program on biotechnology. In 1999, two of these were equipped with the facilities required for genetic transformation (Halos, 2000). Available information shows that there are about 75 scientists with PhD-level training in DNA and biochemical research in these institutions (Sebastian, 1999). These scientists are the staunchest supporters of the government biotechnology program and have been actively involved in the government's effort to educate the public on the benefits from, and safe use of, biotechnology. The IRRI has been an important source of knowledge for local scientists' biotechnology work on rice.

***Private Sector*.** Three multinational companies–Monsanto, Pioneer Hi-Bred, and Syngenta—currently sell Bt corn seeds in the Philippines. Monsanto started commercial sales of MON 810 in December 2002, followed by Pioneer and Syngenta in 2003 and 2005, respectively. Aside from hybrid seeds, these companies have extensive operation in the marketing of agricultural chemicals. In 2003, Monsanto and Pioneer Hi-Bred reported

1. *My own literal translation: Farmers and Scientists for the Advancement of Agricultural Science.*

total gross sales of PhP1.7 billion, or roughly US$30 million (Cabanilla, 2006b).

Farmers. Between 2003 and 2005, there has been a five-fold increase in the area planted with Bt corn in the Philippines (from 10,833 to 52,000 hectares) according to data from the Department of Agriculture. It shows that farmers are appreciating this technology. Interestingly, as more farmers adopted Bt corn, opposition to the technology has apparently subsided. Even opponents within academia have become silent since the successful adoption of Bt corn.

Country Receptiveness to Biotechnology

The Major Entry Points

Given the current structure of Philippine agriculture, rice and corn represent the most obvious entry points for biotechnology development and adoption. The economic and political significance of these crops is high. Around 60% of the Department of Agriculture's budget in the 1990s was allotted to these crops and domestic prices were set 60-70% higher than the world price in support for the country's self-sufficiency objectives (Cabanilla, 2006b). For corn, only the GM yellow variety has been commercialized and there is no current initiative to genetically modify the white corn variety which is primarily a subsistence food crop.

Traits that will improve yield through increased pest and disease resistance are important. Thus, for maize, the introduction of Bt corn has been well received by farmers growing feed corn as their operation is more market oriented (compared to those growing white corn). There is also a national effort to reduce yellow corn imports, which averaged a quarter of a million tons annually during the last decade. For rice, higher tolerance to water stress and acidic soils are of high value. In this context, current biotechnology work of IRRI on rice bacterial blight, water stress, and acidic soils will be beneficial to the country.

Biofortification of rice is of high socio-economic value, and therefore, another major entry point. It represents a viable alternative solution to the chronic micronutrient deficiency among the vulnerable sectors of Philippine society. The Sixth National Nutrition Survey in 2003 showed that 40.1% of children ages 9 months to 5 years were suffering from Vitamin A deficiency disorders (VADD). Iron deficiency anemia (IDA) on the other hand, afflicts 65.9% of infants and 40% of pregnant women (National Nutrition Council, 2005). In the past, the government has addressed this problem through micronutrient supplementation programs (e.g. Vitamin A capsules given to children and lactating mothers).

The enactment of Republic Act 8976, or the Food Fortification Act of 2000, signified the government's resolve in addressing the problem of micronutrient deficiency. This law mandates fortification of key staples, particularly the following: cooking oil with Vitamin A, wheat flour with Vitamin A and iron, refined sugar with Vitamin A, and rice with iron. Under the 2005-2010 Medium-Term Philippine Plan of Action for Nutrition (PPAN), the government's allocation for micronutrient supplementation is P37.11 billion (US$742 million at exchange rate of P50 per US dollar), or 29.3% of the five-year Nutrition Plan budget.

It is in this context that the current work on rice biofortification under the Harvest Plus project finds high value and relevance in the Philippines. Available empirical evidence suggests that social benefits from Vitamin A-enhanced rice (also known as Golden Rice) range from $16-88 million per year or an internal rate of return (IRR) on investments ranging from 66-133% (Zimmermann & Qaim, 2004). Javelosa (Forthcoming) on the other hand, estimates that iron biofortification in rice provides an IRR ranging from 50-92%, while for zinc biofortification, IRR is between 35-73%.

One major advantage in rice biofortification in addressing micronutrient deficiency is that it ensures sustainability of solving a social concern. Government-sponsored food supplementation programs are highly dependent on fiscal constraints. Furthermore, biofortification, in contrast to mandatory food fortification (e.g. Food Fortification Act of 2000), does not entail any enforcement costs.

Scientists at PhilRice are now in the process of adapting the high-Beta carotene trait of the original Golden Rice to local rice varieties. The challenge, however, lies in the promotion for the adoption (by farmers) and consumption of biofortified rice. It is not clear at this stage how farmers react to the introduction of biofortified rice varieties. Most certainly, farmers' acceptance will be influenced by the agronomic traits (e.g. yield) of the biofortified rice varieties. For consumption, changes in taste and prices would be important factors in consumer acceptance.

Researchers at UPLB are studying the efficacy and acceptability of biofortified rice. One such study on high-iron rice (IR 68144-2B-2-2-3 developed through conventional breeding by IRRI) was a 9-month feeding trial done with 192 religious sisters living in 10 con-

vents in Metro Manila. Initial findings from this research show positive results in terms of the efficacy of rice enhanced with iron (Haas et al., 2005).

However, no similar work has been done on GM rice with high beta-carotene content (Golden Rice). To date, the variety has not yet undergone field trials and it is not clear how militant groups and other major stakeholders would react to the introduction of GM biofortified rice considering that it is a major staple.

Among the other crops where work on biotechnology currently exists include (ABSP II; Runge & Ryan, 2004)

- mango (delayed ripening),
- papaya (delayed ripening and resistance to Papaya Ring Spot Virus),
- coconut (lauric acid content),
- tomato (delayed ripening and multiple virus resistance),
- tobacco (delayed leaf senescence and increased yield), and
- Bt eggplant (fruit- and shoot-borer resistance).

Past Experience and Future Direction

The experience of the Philippines with the introduction of Bt corn is a good reflection of its receptiveness to biotechnology. Despite the apparent aversion of some militant groups towards technologies owned by multinationals, opposition eventually dissipated as corn farmers adopted the technology. A remarkable development is the dissipated militant group activity. As more farmers adopted Bt corn, resistance from the various groups opposed to GMO, has greatly diminished. It must be noted, however, that Bt corn is purely for livestock feeds and public reaction to the introduction of the Bt gene to white corn, which is used as human food, has not been put to the test.

There is enough trust granted by society to the NCBP. Scientists engaged in biotechnology research regard the current biosafety guidelines as among the most stringent in Asia. They admit that it is important that environment risks are minimized in order to maintain confidence among practitioners (R. Ebora, personal communication).

Scientists working on Golden Rice predict less resistance to the introduction of this technology for two reasons: (a) it is developed by public research institutions and (b) does not involve gene transfer from non-plant species (a persistent moral-ethical issue raised by the Church). Furthermore, it is an inbred variety, and thus, farmers could use the seed of their own harvest as future planting materials (A. Alfonso, personal communication). This, however, remains to be tested as the technology is not yet ready for adoption. For sure, the government's resolve to promote the technology will be put to the test. It should be noted that the Golden Rice technology gets its value from its contribution to solving micronutrient deficiency and this is not exactly in line with the mandate of the Department of Agriculture, whose objective has been consistently focused on achieving food self-sufficiency.

The capability of the country to generate its own technologies is limited by budgetary constraints. The government recently announced an amount of US$20 million intended to promote biotechnology. It is very small compared to other countries (e.g. China) that are now well ahead in biotechnology R&D. Local adaptation of existing, currently employed technologies (e.g. Bt eggplant from India) would continue to be a practical approach under the current situation. This saves the time of genetic transformation and thus greatly reduces costs of technology development. Sharing resources with other countries also boosts local research efforts (e.g., Papaya Biotechnology Network of Southeast Asia) in pursuing biotechnology R&D.

Brief Outlook

The future of biotechnology in the Philippines looks positive. There is unequivocal support from the government. Opposition has apparently dissipated and more farmers are adopting Bt corn. As more scientists come back from training abroad, national capacity for biotechnology R&D continues to grow. However, with tight budgetary constraints, local adaptation of existing technologies appears to be the most appropriate strategy for biotechnology development for the time being. Work is expected to concentrate on rice and corn, although interest among researchers is now moving towards cash crops (e.g. papaya, tomato, eggplant). Scientists involved in Golden Rice development see the technology finally introduced on the market in five years.

Labeling of GM products is currently not required. In any case, the cost involved and the lack of capacity to trace GM- versus non-GM-derived food products may prevent the implementation of labeling anytime soon. There are reports that GM-derived food products are currently sold in supermarkets (Quilloy, 2006) but to date, no public opposition to these products similar to that manifested during the introduction of Bt corn has been observed. The same militant groups (e.g. Green-

peace) opposed to the introduction of Bt corn continue to oppose work on other crops, such as GM papaya, citing the risks of losing the Japanese export market (De Vera, 2006). However, scientists working on GM papaya are not deterred by this threat as the local market is big enough to accommodate productivity and efficiency gains resulting from the technology (Natividad, 2006).

The future of biotechnology in the Philippines, therefore, will highly depend on the government's resolve in pushing for the adoption of frontier technologies with ample support from the scientific community that will provide the backdrop for a more enlightened public debate on biotechnology. Although non-GM related, the involvement of religious sisters in feeding experiments on biofortified rice may be one good step in slowly bringing together in a more scientific approach the sectors of society that have diametrically opposite perspectives on biotechnology.

For GM biofortified food crops, the greatest challenge is in the area of public information dissemination. The reaction of the general polity to these crops will probably be different from that observed during the introduction of Bt corn. Here, the role of the scientific community will be paramount.

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