THE ECONOMICS OF BT CORN: WHOSE INTEREST DOES IT REALLY SERVE?

A

GREENPEACE

Southeast Asia

REPORT

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EXECUTIVE SUMMARY

Bt Corn in the Philippines was designed to be resistant to the Asiatic Corn Borer (ACB), *Ostrinia furnacalis* (Guenee), one of the most destructive corn pests in the Philippines. It is also presented as a 'golden opportunity', a practical and ecologically sustainable solution for poor corn farmers everywhere to increase their yields, thus improving their livelihoods and alleviating poverty. These claims are misleading. There **are** safer and more viable options in solving the corn borer woes of our corn farmers. Bt corn **is definitely not** a biological means of controlling pests and it **is not** ecologically sustainable.

DOES IT HAVE TO BE BT CORN? (OR BT CORN IS *NOT* THE BEST OPTION)

Genetically Engineered Organisms are unpredictable. When released into the environment they produce unexpected results that could prove damaging in the long term. However, there are quite a number of readily available, cost effective and practical non-GE options that can beat the corn borer without having to resort these crops.

Synchronized planting by farmers with adjacent farms is the most common method used to avoid heavy corn borer attacks per farm. They also recommend planting corn as the main crop during the dry season as more severe infestation usually occurs during the rainy or wet season (July to September).

Detasselling of corn has also been proven to be effective against heavy corn borer attacks. The tassel is the corn borer's primary food source, and taking out 75% of the tassel per field will reduce tremendously the number of larvae that reaches molting when they start boring holes into the corn stem. Other pest management strategies that farmers employ are intercropping, rotation cropping, fallow cropping and planting of conventional corn varieties that are resistant or tolerant to the corn borer.

Use of Bt corn also breeds concern about its impacts on soil health because the toxin in Bt crops is present in the whole plant and is expressed during its whole life cycle. The accumulation of Bt toxin in soil is possible since Bt toxin can persist in soils for over 200 days, particularly if there is a cold winter period. Insect resistance to Bt corn is another growing concern. In a meeting with several government agencies, including the Regional Crop Protection Center in Isabela, Monsanto is said to be looking for ways to assess how long it takes before the Asian corn borer gains resistance to Bt corn. There is overwhelming scientific data to support concerns of insect pest resistance.

THE BT CORN YIELD: MORE OR LESS?

Monsanto claims that yield could increase between a 20-40% with Bt corn compared to conventional corn varieties. In the Department of Agriculture's list of recommended commercial corn varieties, a good number of conventionally bred hybrid corn has the potential of surpassing Monsanto's claims. Among the 43 varieties listed, 11 had the potential yield of more than 8.5 tonnes to 10.5 tonnes per hectare. Monsanto is misleading farmers by making them believe that **only** Bt corn could yield more than 8 tonnes.

BIOLOGICAL CONTROL IS THE WAY FORWARD

While DA is aggressively promoting Bt corn to deal with the corn borer situation on one hand, on the other it is saying that biological control measures are also highly effective. Experts say that the corn borer has natural enemies in the trichogramma (*Trichogramma evanescens* Westwood), earwig (*Euborellia annulata* Fab.), Flower bug (*Orius tantillus* Motschulsky), ladybug, lacewing, and spiders.

The female Trichogramma lays an egg within a recently laid host egg, and could parasitize about 100 eggs and may also destroy additional eggs by host feeding. These wasps are harmless to people, animals, and plants.

Another promising biological control agent against the corn borer is the earwig since it does not only attack corn borer eggs but also the larvae, pupae and adult as well as other corn pests.

The flower bug is yet another predator of the corn borer. Field studies show that 5-7 flower bugs per plant can effectively regulate corn borer populations.

IS BT CORN WORTH IT?

While GE companies such as Monsanto claim that GE crops reduce the need for chemical inputs thereby resulting in more savings, more and more farmers in the US and Canada, in fact, are finding that GE crops only breed greater dependence on chemical inputs.

In the Philippines, the cost of Bt corn seeds are very high. Bt corn is sold at P4,400 to P4,900 per 18-kg bag. On the other hand, conventionally-bred hybrid seeds sell only at about P1,500 to P2,700, and Open Pollinated Varieties (OPVs) between P460 to P1200. An 18kg bag of seeds covers one hectare of land for hybrid and Bt corn, and 20kg bags for OPVs. Fertilisers used include Urea (P800—P900/bag), 14-14-14 (P750/bag) or 16-20-0, and usage is 2 to 3 bags per hectare for OPVs, 6 bags for hybrid, and 15 bags for Bt Corn. This large quantity of fertilisers recommended by the Monsanto agent was probably to artificially boost the yield for the first crops in order to convince other farmers to switch to Bt corn.

Comparison of costs for 1 hectare of land shows that OPV costs only about P3,570 if Trichogramma is used to protect crops, and around P5,500 if common pesticide is used. Hybrid on the other hand ranges only from P7,470 (tricho-protection) to P11,100 (pesticide). Bt corn however, at its cheapest, already costs P12,100 to around P18,400.

TAKING CONTROL OF OUR GENETIC RESOURCES

Genetic Engineering is very much an issue of control. Monsanto and other GE companies are able to obtain patents on these GE seeds /crops which then forces users of the products or the technology to pay royalties or technology fees to the company. A farmer who grows any GE seed is **not** allowed to save its seeds for the next cropping or exchange it with another farmer, a practice which farmers in the

Philippines and in other countries have been doing since time immemorial until the advent of hybrid seeds.

Even a farmer who does not choose to plant GE seed may also face the risk of getting sued from patent infringement if his field gets contaminated by GE crops via cross pollination or seed mixing. There are numerous cases in North America where Monsanto took legal action against farmers whose fields got contaminated by GE crops. Monsanto has an annual budget of $10 Million and 75 staff devoted solely to investigating and prosecuting farmers.

The most famous case is that of Percy Schmeiser, a Canadian canola farmer whose field got contaminated with GE canola from a neighbor's field. He has spent more than $230,000 in legal bills for the past 5 years. After several years of deliberation, the Supreme Court of Canada decided on May 2004 that Monsanto's patent claims **is** valid.

With GE crops, genetic contamination **is** inevitable. Bt corn, in particular, is a wind-pollinated crop, thus, contamination is highly likely. Data shows that 98% of the pollen may be found within a 25-50 m radius. Smaller amounts travel to as far as 0.8 km under "suitable conditions".

CONCLUSION

To date, Bt corn has neither proven to be a practical, nor ecologically sustainable option for small Filipino farmers for the following reasons:

1. The corn borer is a pest that is manageable. Various groups have enumerated various cultural and biological control methods that have been cheap, readily available and proven effective against the corn borer making it illogical to invest in Bt corn.
2. Bt corn seeds are a lot more expensive than non-Bt hybrids and OPVs even with additional cost for biological control methods.
3. Yield from non-Bt varieties could match if not exceed Bt varieties.
4. There are strong indications of negative effects to the soil ecosystem and non-target organisms.
5. Farmers may be sued for patent infringement or be exposed to other legal challenges from saving Bt corn seeds or from contamination of their crops.

Clearly, Bt corn is not a viable option for small Filipino farmers. It is an economic fluke. Bt corn has shown the true intentions of the GE companies, whose main motive for forcing GE crops on the world **is**, and remain to be, profit maximization.

GREENPEACE DEMANDS FOR THE GOVERNMENT:

1. **To stop the release of new GE crops into the environment;**
2. **Stop the importation of new GE crops;**
3. **Establish efficient and sufficient segregation systems for GE and non-GE grains;**
4. **Institute rehabilitation and mitigation measures for areas that have been contaminated;**
5. **Speed up the promulgation of legislative measures that would address problems brought about by Genetic Engineering; and**
6. **Allocate substantial financial and technical support for the development of non-GE alternatives.**

The Economics Of Bt Corn:
Whose Interest Does It Really Serve?

INTRODUCTION

Bt Corn, a genetically engineered (GE) corn created by the US agribusiness giant, Monsanto, is projected by its developers and supporters as a practical solution to the problem of world hunger. It is also presented as a 'golden opportunity' for poor corn farmers everywhere to increase their yields, thus improving their livelihoods and alleviating poverty.

Monsanto claims that Bt corn increases yields, brings economic benefits to farmers and is ecologically sustainable. These claims are misleading the public and their claim of increased yield is an empty promise to farmers.

Bt Corn in the Philippines was designed to be resistant to the Asiatic Corn Borer (ACB), *Ostrinia furnacalis* (Guenee), one of the most destructive corn pests in the Philippines.[1] The Asiatic Corn Borer damages corn plants through boring holes in the stems and pods that cause wilting of the leaves and crop losses. Data from the Bureau of Agricultural Research suggests that crop damage due to the corn borer is 20 to 30% annually.[2] In addition to the corn borer, other pests causing damage to corn crops in the Philippines include the corn seedling maggot, white grub, corn semi-looper, common cutworm, true armyworm, corn earworm, corn leaf aphid, corn plant hopper, leaf hopper, locusts thrips, whiteback, bollworm, budworm, lesser grain borer, weevil, silk beetle, red flour beetle, fungal pests and rats.[3],[4]

Despite public concerns and opposition to the planting of GE crops, the Philippines has recently approved the commercialization of other varieties of genetically engineered corn. The government approved Roundup Ready corn early this year, a variety of genetically engineered corn that is resistant to the herbicide glyphosate by Monsanto. Syngenta's Bt11, another variety of Bt corn, was approved in 2004 for commercialization and is now being distributed all over the country.

To date, the Philippine government is still actively promoting Bt corn in spite of the controversies involving patent arrangements, contamination of non-GE corn stocks (such as Syngenta's 'accidental' release of Bt10 that contains an antibiotic resistance marker gene), and impacts on health and the environment.

There are safer and more viable options. *Bt* corn is definitely not a biological means of controlling pests and is not ecologically sustainable.

BT CORN IS NOT THE BEST OPTION

Genetically Engineered Organisms (or GMOs) are unpredictable. When released into the environment they produce unexpected results that could prove to be damaging in the long term. *Bt* crops, in particular, contain a bacterial toxin with insecticidal properties that is continuously produced and released into the environment.[5] Preliminary studies show strong indications of negative effects on non-target organisms[6] and the soil ecology[7] and fertility although most of the impacts remain largely unknown.

According to Monsanto, Bt corn "holds tremendous promise for offering a sustainable, ecological approach to pest control... reducing reliance on chemical insecticides..."[8] Monsanto fails to mention that choosing Bt corn is not the most ecologically nor sustainable approach. There are quite a number of readily available and effective non-GE options that can beat the corn borer without having to resort to chemicals. It has been suggested that the most cost effective and practical method for controlling the corn borer is by cultural means.[9]

Synchronized planting by farmers with adjacent farms is the most common method used to avoid heavy corn borer attacks per farm. Damage per farm is minimized because corn borer distribution per hectare is lower.[10] Masipag, a farmer-scientist organization, has extensive experience in sustainable farming from its farmer-based membership. They also recommend planting corn as the main crop during the dry season as more severe infestation usually occurs during the rainy or wet season (July to September).

Detasselling of corn has also been proven to be effective against heavy corn borer attacks. Within every 4 rows of corn, three rows are detasselled and 1 row remains intact. The tassel is the corn borer's primary food source and taking out 75% of the tassel per field will reduce tremendously the number of larvae that reaches the 3rd – 5th instar (molting) when they start boring holes into the corn stem.[11]

Other pest management strategies that farmers employ are intercropping, rotation cropping, fallow cropping and planting of conventional corn varieties that are resistant or tolerant to the corn borer such as the local "Tiniguib" variety[12] and several OPVs and Hybrids listed in the Department of Agriculture's Recommended Commercial Corn Varieties.[13]

Proponents of Bt corn, such as Monsanto, often claim that it is a biological means of controlling pests and is ecologically sustainable.

The use of naturally occurring Bt toxins in foliar sprays kill targeted pest with very little effect on beneficial predator insects.[14] However, the Bt toxins produced by insect resistant crops are different and require less processing to generate the toxin, so are less selective and have been shown to be harmful to beneficial predator insects.[15] *Bt* proteins from natural *Bt* sprays degrade relatively quickly in the field as a result of ultraviolet light and lose most toxic activity within several days to two weeks after application[16]. In *Bt* crops, however, the *Bt* toxin is produced throughout the entire lifespan of the plants.

There is also growing concern about the impacts on soil health of Bt crops because the toxin is present in the whole plant and is expressed during the whole life cycle of the plant. The accumulation of Bt toxin in soil is possible even after the crops are harvested because of Bt crop residues left in the field.[17] *Bt* crops secrete the toxin from the root into the soil[18] and *Bt* crop residues left in the field contain the *Bt* toxin. The *Bt* toxin can persist in soils for over 200 days, particularly if there is a cold winter period[19]. Therefore, *Bt* proteins are likely to be present in the soil, not only throughout the growth of the crop, but also long after the crop is harvested. This accumulation of Bt toxin in soil could have adverse effect on soil health affecting a range of non-target organisms as well, including earthworms.[20]

Insect resistance to Bt corn is another growing concern. In a meeting with several government agencies, including the Regional Crop Protection Center in Isabela, Monsanto is looking for ways to assess how long it takes before the Asian corn borer gains resistance to Bt corn.[21] Concerns are also coming from the National Corn Program stating that the improper use of Bt corn might lead to this.[22] There is overwhelming scientific data to support concerns of insect pest resistance.[23]

THE BT CORN YIELD: MORE OR LESS?

"Corn borer protection, increased yields guaranteed". This was written on a Monsanto billboard in the province of Isabela.

Monsanto Billboard seen in Isabela, December 2003. Photo: Beau Baconguis.

Monsanto claims that there has been between a 20-40% increase in yield with Bt corn compared to conventional varieties in the Philippines.[24] Farmers testifying to an 8 to 8.5 tonne harvest per hectare of Bt corn are featured in their TV and radio ads aired in Isabela. Noel Borlongan, Government and Public Affairs Director for Monsanto, wrote that in Ilagan, the yield was 9 tonnes per hectare compared to a 7-tonne yield from conventional corn.[25] One of the avid promoters of Bt corn in Isabela says that his yield was 8.5 tonnes per hectare during his first cropping, which was harvested during the first quarter of 2003.[26]

There are a lot of factors that could have affected the high yields during that time. It is possible that this was due to favorable weather conditions or even to the hybrid variety of corn it came from. Monsanto has always claimed that Bt corn yields are a lot higher than conventional varieties and has even used non-hybrid varieties as a comparison. The specific hybrid corn without the Bt gene should have been the point of comparison used by Monsanto instead of misleading the public into thinking that Bt corn was genetically engineered to increase yields.

The DA reported that there was a surge in corn production in Region II during the first quarter of 2003.[27] Favorable weather conditions, optimal soil moisture, and the use of hybrid seeds resulted in the 50.2 percent increase in corn production in that period.

Further, in the DA's list of recommended commercial corn varieties, conventionally bred hybrid corn has the potential of surpassing an 8.5 tonne yield.[28] Among the 43 varieties

listed, 11 had the potential yield of more than 8.5 tonnes to 10.5 tonnes per hectare. All were non-Bt yellow corn varieties. These varieties could definitely perform as good as or better than Bt corn during the first quarter of 2003. However, Monsanto is misleading farmers by saying that only Bt corn could yield more than 8 tonnes.

This is supported by the results of a study by the University of Missouri Variety Testing Program in 1999 showed that the yield of Bt corn varieties is comparable to non-Bt varieties.[29] Natural infestations of the pest yielded a 1-bushel per acre difference between the top 10 Bt hybrids and top 10 non-Bt hybrids. With artificial infestations with the European Corn Borer, the yield difference was slightly bigger, with Bt varieties having a yield of 3 bushels more per acre compared to non-Bt varieties. The study concludes that yield protection is greatest when there is heavy infestation although there are non-Bt varieties that yield well despite heavy infestation.[30]

BIOLOGICAL CONTROL IS THE WAY FORWARD

While the Philippine Department of Agriculture (DA) is aggressively promoting Bt corn to deal with the corn borer situation on one hand, on the other hand it is saying that biological control measures are also highly effective. Experts say that the corn borer has natural enemies in the trichogramma (*Trichogramma evanescens* Westwood), earwig (*Euborellia annulata* Fab.), Flower bug (*Orius tantillus* Motschulsky), ladybug, lacewing, and spiders.[31]

Trichogramma are tiny wasps that attack the eggs of more than 200 species of moths and butterflies and are an efficient and natural method to control the corn borer. The female Trichogramma lays an egg within a recently laid host egg, and as the wasp larva develops, the host egg turns black. Each female parasitizes about 100 eggs and may also destroy additional eggs by host feeding. The short life cycle of 8-10 days allows the wasp population to increase rapidly. These wasps are harmless to people, animals, and plants.[32]

The National Crop Protection Center promotes biological control of the corn borer through its Trichogramma program. The Regional Crop Protection Center (RCPC) in Ilagan, Isabela provides around 500,000 Trichocards in the provinces of Region II and claims that in Isabela there have been no reports of significant infestations by the corn borer in the last 5 years.[33] According to the RCPC, the corn borer has been reduced to the status of a secondary pest because of the success of the DA's Trichogramma program, which has reached about 60-70% of corn farmers in Region II.

Trichocards are cardboards that contain the pupa of the Trichogramma and contain around 1500 – 2000 parasitoids. These were given for free to farmers through the Municipal Agriculturists but due to budget constraints, these will be sold to farmers at a cost of P 0.50 to P 1.00 per Trichochard in 2005.[34] The number of trichocards and intervals of release depend on the monitored corn borer egg masses during the early to mid-whorl stage or 20-25 days after planting.[35] For every 100 plants with 3-5 egg masses, 70-100 cards are released per hectare. After a week, an egg mass parasitism of less than 20% necessitates a second release. A third release may be done after another week only in very rare cases where parasitism is low. However, on the average, a farmer needs around 70 Trichochards, 50% of which are released 20 – 25 days after planting and the remainder after 7 days.

Mr. Paulino Matamis showing samples of Trichocards at the Regional Crop Protection Center in Ilagan, Isabela.

Choosing the Trichogramma option has also weaned farmers away from expensive and highly toxic chemical inputs.[36] Farmers that have shifted to Trichogramma say they have stopped using chemicals altogether when they started using trichocards because they have seen that it is effective in controlling corn borer populations. Those that have used trichocards only since the last 2 cropping testify to the fact that the corn borer attack has been limited to about 15 – 25 per cent only of their field. They are confident that the effectiveness of the Trichocards will improve in the next croppings because by then the populations of the Trichogramma will have already been established.[37]

The low cost, availability, the effectivity of trichogramma and the significant reduction of chemical inputs[38] have made Trichogramma an extremely attractive option for poor farmers. These have contributed to the success rate of the program, which has effectively reduced the occurrence of corn borer by 80-85% in the province of Isabela.[39]

Another promising biological control agent against the corn borer is the earwig since it does not only attack corn borer eggs but also the larvae, pupae and adult as well as other corn pests. The mode of releases is the same as with Trichogramma. Production costs 60 centavos per earwig.[40] Finally, Dr. Belen Morallo-Rejesus argues that the sustainability of releasing earwigs is not difficult as it can disperse to as far as 6 meters from release point.[41] Further, it is more effective with open pollinated varieties and yellow corn.

The flower bug is another predator of the corn borer. It may be reared in the laboratory but rapidly reproduces near stands of spiny amaranth (*Amaranthus spinosus*). Field studies show that 5-7 flower bugs per plant can effectively regulate corn borer populations.[42]

IS BT CORN WORTH IT?

While GE companies such as Monsanto claim that GE crops reduce the need for chemical inputs thereby resulting in more savings, more and more farmers in the US and Canada are finding that GE crops only breed greater dependence on chemical inputs.[43]

Looking at a four-year US Department of Agriculture data on the use of chemicals with GE crops, Charles Benbrook concluded that even in North America, there is a growing trend of increasing dependency on chemical inputs.[44] In his report he pointed out the total area treated with corn borer insecticide increased slightly by 0.55% from 1995 to 2000. Much higher figures were observed for other GE crops, particularly herbicide tolerant crops. Professor John Obrycki of the Iowa State University concludes that insecticide use has not decreased from 1995 to 2000.[45]

In a subsequent report, Charles Benbrook concluded that overall pesticide use in areas planted to GE crops have risen about 4.1 percent.[46] Increasing use of chemical inputs has severe impacts on soil health and biodiversity. This study therefore contradicts claims by Monsanto that GE crops would lead to a big reduction in pesticide use.

It is not the poor farmers worldwide who are getting a windfall from the Bt Corn "revolution" but rather the corporations producing the engineered seeds and producing, marketing and selling its required farm inputs. Benbrook reports that from 1975 to 2000, there has been a tremendous rise in seed and chemical sales, especially between 1994 and 1996, which coincided with the advent of Bt corn.[47] In 1985, the cost of seed and chemicals constituted 10% of the gross income of farmers. A decade later, it was about 25%. Benbrook attributes the increasing farming expenditure to technology fees and premiums charged for Bt corn.

The University of Missouri study[48] likewise concludes that while the yield for Bt corn is higher during corn borer infestations, the researchers also pointed out that it does not mean that it is profitable to plant Bt corn. They argue that non-Bt varieties are still more profitable because of the lower cost of seeds.

A study by the University of Iowa came up with the conclusion that with the insignificant yield but higher premiums that one had to pay for Bt varieties, the loss of returns were $28.28 per acre while for non-Bt varieties, it was $25.02 per acre.[49] In the US Bt corn seed costs 30-35% higher than conventional varieties.[50]

In the Philippines, the cost of Bt corn seeds are very high, approximately twice the price of the more expensive non-Bt hybrids. Bt corn is sold at P 4,400.00 to 4,900[51] per 18-kg bag and guarantees by other "farmers" of corn borer protection and consequent increased yields may convince them to try the seeds.[52] However, not all farmers are willing to take that risk. Because Bt corn seeds are a lot more expensive as compared to conventionally bred hybrid seeds, which sell at about ₱ 1500.00 to 2700.00[53] and Open Pollinated Varieties (OPVs) between ₱ 460.00 to 1200.00[54], a higher capital outlay per hectare is needed to purchase such seeds. With the high cost of chemicals, unpredictable weather conditions and depressed corn prices, some farmers are fearful that they will sink deeper and deeper into debt.

An 18 kg bag of seeds covers one hectare of land for hybrid and Bt corn and 20 kg bags for OPVs. So a farmer who uses Bt corn seeds spends P 4,900 per hectare, assuming that no pesticides will be used as the seeds are allegedly pest resistant or "insect-protected".[55]

Fertilisers used include Urea (P800.00 – 900.00/bag), 14-14-14 (P750.00/bag) or 16-20-0 and usage is 2 to 3 bags per hectare for OPVs, 6 bags for hybrid and 15 bags for Bt Corn in Naujan, Oriental Mindoro[56]. This large quantity of fertilisers recommended by the Monsanto agent was probably to artificially boost the yield for the first crops and convince other farmers to switch to Bt corn. In Isabela, recommended fertiliser usage is around 4 bags per hectare for OPVs and 6 to 8 bags both for hybrid and Bt corn[57].

Pesticides used are Furadan and Carbofuran[58]. Furadan costs P2000 per hectare. Carbofuran costs around P900.00 and 250 mL is used per hectare.

The following charts are comparisons of costs for one hectare of land (common costs such as labor for furrowing the land are not included). Prices are in Philippine Peso (PHP).

Naujan, Oriental Mindoro

	OPV		Hybrid		Bt Corn
Seeds	800.00	800.00	2000.00	2000.00	4900.00[59]
Fertilizer[60]	2700.00	2700.00	5400.00	5400.00	13500.00[61]
Pesticide	2000.00		2000.00		0.00[62]
Trichogramma (70 x P1.00)		70.00		70.00	0.00
TOTAL	P5500.00	3570.00	9400.00	7470.00	18400.00

Isabela Province[63]

	OPV		Hybrid		Bt Corn
Seeds	520.00[64]	520.00	2700.00	2700.00	4900.00
Fertilizers[65]	3600.00	3600.00	7200.00	7200.00	7200.00
Pesticide[66]	1200.00		1200.00		0.00[67]
Trichogramma (70 x P1.00)		70.00		70.00	
TOTAL	**5320.00**	**4190.00**	**11100.00**	**9970.00**	**12100.00**

On the other hand, a farmer that uses non-Bt hybrids and OPVs and biological control methods like Trichocards for protection from corn borer, spends only for seeds if the trichocards are availed of for free. But if a charge of P 1.00 per card is set, with the recommended 70 cards per hectare by the RCPC, a farmer will incur an added cost of P 70.00 only for pest control instead of P2000.00 for pesticides. If the price of hybrid seed is pegged at P2000 per bag, then the cost will reach a maximum of P2070.00. Therefore, the use of non-Bt varieties with trichocards is still much cheaper than Bt corn seeds. In terms of inputs, Bt corn, as well as hybrids, require a lot more fertiliser as opposed to OPVs. This is probably the reason why marginal farmers in the Philippines are still hesitant to buy Bt corn seeds.

But even in America itself, ordinary farmers are learning slowly that GE does not translate to "better". In a study done by the Soil Association of UK on the experiences of North American Farmers with genetically modified crops, it is obvious that the promises put forth by GE technology have fallen drastically short of plans.[68] For one, high-yields with Bt Corn are not constant and sometimes come rarely. And in terms of income gains, when combined,

and when contrasted with overall incomes from past, pre-Bt Corn seasons, farmers have in fact suffered millions of dollars in net loss. In the Soil Association Report, farmers have put forth damage claims about because of GE contamination, which has caused the downfall of their export market to the European Union, their main market by 99.4% from $305 million to $2.8 million.

TAKING CONTROL OF OUR GENETIC RESOURCES

Genetic Engineering is very much an issue of control. Monsanto and other GE companies are able to obtain patents on these GE seeds /crops which then forces users of the products or the technology to pay royalties or technology fees to the company. A farmer who grows Bt corn or any GE seed is not allowed to save its seeds for the next cropping or exchange it with another farmer, a practice which farmers in the Philippines and in other countries have done since time immemorial until the advent of hybrid seeds.

A letter from Jim Tobin of Monsanto addressed to soy products exporters to Europe specifically states that they will start enforcing the patent on seed and royalty (technology fee) in countries where they have patents on the Roundup Ready gene.

There is an ongoing debate whether GE crops are patentable or not under Philippine jurisprudence. Government representatives from the agriculture department frequently claim in public debates that GE crops are not patentable under Philippine patent laws. However, the high price Hybrid and Bt Corn seeds command is already a way for Monsanto and other companies to charge royalties on farmers. Section 21 of The Intellectual Property Code of the Philippines (Republic Act 8293) states that "[a]ny technical solution of a problem in a field of human activity which is new, involves an inventive step and is industrially applicable shall be patentable. It may be, or may relate to, a product, or process, or an improvement of any of the foregoing."

However, under Section 22 also provides for what cannot be patented. Section 22.4 states,

> "Plant varieties or animal breeds or essentially biological process for the production of plants or animals. This provision shall not apply to micro-organisms and non-biological and microbiological processes."

Here it is clear that nature and biological processes may not be patented. However, clarity has to be sought as to whether what Monsanto and GE companies would like to have patented in the Philippines is the engineering process and not the seeds or products.[69] To date, no case has yet been filed with the Philippine Supreme Court to test this jurisprudence.

GE companies may take recourse in the new Plant Variety Protection Act which "protects developers of plant varieties that are new, distinct, uniform and stable".[70] It gives the developer the right to authorize others to produce or reproduce, condition for the purpose of propagation, offer for sale, sell or market, export, import and stock for any purpose mentioned above the plant variety, such authority subject to conditions and limitations the holder may prescribe.

This may have been the basis for Monsanto's "Additional Terms of Sale" printed on the back of a Yieldgard sack. It reads:

> "By acceptance of this seed, buyer expressly agrees that the parental lines used to produce this hybrid seed may include one or more parental lines which are the exclusive property of Monsanto and that buyer does not acquire any right to use such parental line or lines or the parts or products of such parental lines for any purpose other than production of forage or grain for feeding or processing without the express written consent of Monsanto."

With Bt and hybrid corn seeds, the seed saving tradition of Filipino farmers who plant OPVs may put them at risk of being sued by Monsanto or any other patent holder for patent infringement.

However, a farmer who does not choose to plant GE seed, may also face the risk of getting sued from patent infringement if his field gets contaminated by GE crops via cross pollination or seed mixing. There are numerous cases in North America where Monsanto took legal action against farmers whose fields got contaminated by GE crops.[71] In the Monsanto vs. U.S. Farmers report, Monsanto has so far been granted a total $15,253,602.82 from judgments. This is not at all surprising since Monsanto has an annual budget of $10 Million and 75 staff devoted solely to investigating and prosecuting farmers.[72]

The most famous case is that of Percy Schmeiser, a Canadian canola farmer whose field got contaminated with GE canola from a neighbor's field. Schmeiser decided to battle Monsanto in court and lost twice in the lower courts. He has spent more than $230,000 in legal bills for the past 5 years. After several years of deliberation, the Supreme Court of Canada decided on May 2004 that Monsanto's patent calims is valid. However, Schmeiser did not have to pay the technology fee of of US$ 15/acre demanded by Monsanto.[73]

Roger, Rodney and Greg Nelson are farmers from North Dakota who previously planted Monsanto's Roundup Ready soya. The family was accused by Monsanto of saving seeds following tests allegedly done by Monsanto on their crops. While they would like to stick to conventional seeds, because yield from Roundup Ready seeds were less but herbicide use increased, they are worried that avoiding contamination will become more and more difficult.[74] Eventually, an out of court settlement was awarded to the Nelsons when they finally proved that almost half of the GPS sample sites were not take from their farm.[75]

With GE crops, genetic contamination is inevitable. Examples include the widespread contamination of GE canola in Canada, GE papaya contamination from a government research station field trial in Thailand and the discovery of Starlink corn, a variety only allowed for animal feed, in food products in the US. These are borne out of experiences in the last decade of growing GE crops. Bt corn, in particular, is a wind-pollinated crop, thus, contamination is highly likely. It is estimated that an individual corn plant has between 4.5 to 25 million pollen grains.[76] Production of pollen happens over a period of 2-14 days, sometimes up to 19 days.[77]Although 5% of self pollination can occur with corn, majority of it travels. Data shows that 98% of the pollen may be found within a 25-50 m radius. Smaller amounts travel to as far as 0.8 km under "suitable suitable conditions". Pollen can remain viable for 24 hours to a few days but with increasing temperatures the viability decreases.

Farmers in the US who do not want to plant GE crops are faced with the difficulty of finding seeds that are not contaminated.[78] Low levels of DNA sequences derived from transgenic varieties are found in traditional varieties of corn, soybeans and canola.

The above data has far-reaching implications for small farmers in the Philippines whose landholdings average about 1.5 hectares. The lack of control or mitigating measures such as refugia and absence of monitoring systems will make Filipino farmers more vulnerable to contamination. If this is happening to farmers in America, the bastion of genetic engineering research and corporate power, how much more the Philippines?

CONCLUSION:

To date, Bt corn has not proven to be an attractive option for small Filipino farmers for the following reasons:

1. The corn borer is a pest that is manageable. Government agencies, the academe, NGOs and farmers themselves have enumerated various cultural and biological control methods that have been cheap, readily available and proven effective against the corn borer making it illogical to invest in Bt corn.
2. Bt corn seeds are a lot more expensive as non-Bt hybrid seeds even with additional cost for Trichogramma cards as biological control methods.
3. The yield for non-Bt varieties is comparable with Bt varieties.
4. There are strong indications of negative effects to the soil ecosystem and non-target organisms.
5. Farmers may be sued for patent infringement or be exposed to other legal challenges from saving Bt corn seeds or from contamination of their crops.

Clearly, Bt corn is not a viable option for small Filipino farmers. It is an economic fluke for farmers. Bt corn has shown the true intentions of the GE companies, whose main motive for forcing GE crops on the world is profit maximization.

As mentioned above, there are examples of successes with non-GE alternatives. These are the most viable options that need to be supported and prioritized as they have been proven to be safe, more ecologically sound, economically beneficial to as many people as possible, and is in the control of farmers.

GREENPEACE DEMANDS FOR THE GOVERNMENT:

1. To stop the release of new GE crops into the environment;
2. Stop the importation of new GE crops;
3. Establish efficient and sufficient segregation systems for GE and non-GE grains;
4. Institute rehabilitation and mitigation measures for areas that have been contaminated;
5. Speed up the promulgation of legislative measures that would address problems brought about by Genetic Engineering; and
6. Allocate substantial financial and technical support for the development of non-GE alternatives.

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