Socio-economic Impacts of Genetically Modified Corn In the Philippines

Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura
MASIPAG
2013

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2611 Carbern Village, Anos
Los Baños, Laguna 4030 Philippines
Telephone: 6349 536 5549
Email: info@masipag.org http://www.masipag.org

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MASIPAG is a network of farmers' groups, scientists and non-government organizations in the Philippines seeking to improve farmers' quality of life through their control over genetic resources, agricultural technology and associated knowledge.

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Acknowledgement

"Lahat ng binhi ay pag-aari ng sangkatauhan. Sa paggamit ng sariling binhi ay may kalayaan ka; kalayaan sa sakit, kalayaan sa gastos, kalayaan sa pagsandal sa mga kumukontrol sa iyo na nagbebenta ng binhi at kemikal. Ito ay iyong karapatan, ito ay iyong pribilehiyo."

Prefecto "Ka Pecs" Vicente

This paper is dedicated to the thousands of corn farmers and their families, whose sacrifices and hardships are testament to their effort to feed the nation. It is their stories of struggle and courage in facing the daily challenge of farming that is at the center of this research. We hope that by writing this paper, we can contribute in uplifting the life and livelihood of the corn farmers. It is high time that their efforts be appreciated, and that their rights safeguarded and protected. To the farmers and families who have assisted us and shared their experience as well as accommodated and welcomed us during the study, we extend our heartfelt thanks.

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Foreword

Ten years ago, the Philippine government approved the commercial propagation of Bt corn. Since then, eight GMO corn varieties had been approved for commercial propagation in the form of Bt corn, RR corn and a combination of pyramided and stacked traits of the same GM transformation events. Over the same period, fifty nine GMO crops/events were also approved for importation for direct use as food, feed, and for processing.

The current wide cultivation of GM corn, estimated at more than 600,000 ha, had been used as the surrogate evidence for the benefits of corn farmers. Their logic states that no farmer would plant GM corn unless they benefit from doing so. But behind the veneer of rapid expansion of GM corn planting is the aggressive and well capitalized propaganda machine of the biotech companies, enabled and supported by pro-GMO policy and program of the government, and enhanced by promotional arrangements by local financier-traders, and seed/agro-chemical companies.

Promoters of GM crops always recite a litany of benefits including better yield, less pesticides, safe to eat, environmentally friendly and good for biodiversity, climate change mitigation, and improved income of farmers despite lack of sufficient evidence. In other times, the benefits are drum beaten in isolation with other important socio-economic factors. Risk acceptability which normally lie in the realm of policy and social acceptability are mostly dictated by pro-GMO technical people.

There is now a growing evidence on the adverse effects of GM food and crops on health and environmental. These include the emergence of superweeds as well as shifting of dominant insect pests, and contamination of non-GM crops. Likewise, price of GM seeds have become exorbitant and farmers income has dramatically declined, sometimes negative.

While evidences on the health and environmental effects of GMOs are accumulating, the data on socio-economic impacts of GMOs are very few. Thus, MASIPAG engaged the services of IBON foundation to elucidate the socio-economic impacts of GMOs on farmers.

This book attempts to unravel how GM corn has changed the landscape of corn farming in the country. Perhaps, the socio-economic changes brought about by GM corn would serve as "late lessons from early warning". We hope that agriculture policy makers will open up their eyes and minds to develop policy responses in favor of small scale farmers in the light of the new evidences. This research is very timely as other GM crops, such as Bt eggplant and golden rice, are in the process of testing towards commercialization.

We dedicate this book to MASIPAG farmers who are very determined and active in the development of local seeds and diversified and sustainable farming systems which are truly alternative to modern biotechnology.

Dr. Charito P. Medina
National Coordinator
MASIPAG

List of Acronyms

AO	Administrative Order
ARB	Agrarian Reform Beneficiaries
BAI	Bureau of Animal Industry
BAS	Bureau of Agriculture Statistics
BCT	Biotech Core Team
BIOTECH	National Institute of Molecular Biology and Biotechnology
BLSB	Banded Leaf and Sheath Blight
BPI	Bureau of Plant Industry
Bt	*Bacillus thuringiensis*
CPH	Corn Plant Hopper
CSO	Civil Society Organization
DA	Department of Agriculture
DAGAMI	Danggayan Dagiti Mannalon ti Isabela
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DILG	Department of Interior and Local Government
DNA	Deoxyribonucleic Acid
DOH	Department of Health
DOST	Department of Science and Technology
DTI	Department of Trade and Industry
EO	Executive Order
ERDB	Ecosystems Research and Development Bureau
FGD	Focused Group Discussion
FPA	Fertilizer and Pesticide Authority
GBP	Gabay sa Bagong Pag-asa
GMO	Genetically Modified Organism
GOCC	Government Owned and Controlled Corporations
GVA	Gross Value Added
Ht	Herbicide tolerant
IPB	Institute of Plant Breeding
IRRI	International Rice Research Institute
ISAAA	International Service for the Acquisition of Agribiotech Applications
KAMACA	Kahublagan Sang Mangunguma sa Capiz
KII	Key Informant Interviews
LBP	Land Bank of the Philippines
LGU	Local Government Unit
MAO	Municipal Agriculture Officer
MASIPAG	Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura
MDG	Medium Development Goals
MENRO	Municipal Environment and Natural Resources Office
MGPC	Mindanao Grains Processing Co.
MMT	Million Metric Tons
MISFA	Mindagat Integrated Farming Association
NABCOR	National Agribusiness Corporation
NCBP	National Committee on Biosafety of the Philippines
NFA	National Food Authority
OFFERS	Organic Farm Field Experimentation Research Station
OPV	Open Pollinated Variety
PAFMI	Philippine Association of Feed Millers Inc
PAMANGGAS	Paghugpong sang mga Mangunguma sa Panay kag Guimaras

PCASTRD	Philippine Council for Advanced Sciences Research and Development
PD	Presidential Decree
PhilMaize	Philippine Maize Federation, Inc
Php	Philippine peso
PPP	Pesticide Protected Plants
RESIST	Resistance and Solidarity Against Agrochemical TNCs
RMCC	Reina Mercedes Corn Processing Center
RFU	Regional Field Unit
RR	Roundup Ready
SA	Sustainable Agriculture
UPLB	University of the Philippines Los Baños
USDA-FAS	US Department of Agriculture – Foreign Agricultural Service
TNC	Transnational Companies
WTO	World Trade Organization

Introduction

On December 4, 2002, the Bureau of Plant Industry approved the commercial propagation of Mon 810, more popularly known as *Bacillus thuringiensis* (Bt) corn, the first genetically modified organism to be released in the country.

The approval was issued despite widespread protests from farmers, consumers, including medical professionals and scientists. Resistance stems largely from the inadequate scientific research that would attest without doubt the safety of the technology on human health and the environment and disregard on farmer's rights due to the privatization of seeds.

Bt corn proponents led by transnational giant Monsanto, the Philippine government, and some scientists from the University of the Philippines Los Baños insist that the propagation of Bt corn will solve the problem of corn borer infestation and increase the productivity and income of Filipino corn farmers. They also claim that Bt corn is safe, has proven benefits to biodiversity, and helps reduce carbon dioxide emissions due to assumed lessened use of chemicals.

Ten years after, proponents have boasted increase in income by Filipino farmers who have adopted the GM technology, reduction on pesticide application and even climate change mitigation. However, evidences of negative health impacts on animals using GM corn are being documented by independent experts. Problems on the effect of GMOs in the environment such as emergence of pest resistance, soil erosion, and contamination among others are also being observed. More so, the negative socio-economic impacts to small farmers are being felt, but there is yet a study that has attempted to shed light on the issue.

At present, a new wave of GMOs are being tested in the country; Bt eggplant (Bt talong) and Golden Rice. Propagation is being planned in the absence of a critical assessment of the long-term impact of the GM corn commercialization on farmers' livelihood, consumer health, animal health, and the environment. Therefore, there is an urgent need to analyze the socio-economic impact of GM corn before proceeding with further commercialization of other GM crops.

This research aims to: 1) document the effects of GM corn, with emphasis on the socio-economic aspect, on the small-scale farmers in the provinces where GM corn has been planted extensively; 2) describe the operations of agrochemical TNCs, landlords, traders, local government, and quasi-government scientists in promoting GMOs in the country; 3) determine the changes in the structures of ownership and control of the selected communities over the land, natural and

genetic resources as results of planting GMOs; and 4) elaborate the ongoing resistance of the communities against GMOs propagation in the country.

The paper has six parts:

Part One discusses the Philippine experience in biotechnology, and the technology behind genetic modification of living organisms, specifically Bt corn. The discussion includes government regulation and guidelines and the roles of specific government agencies in the monitoring of GMO testing, importation and propagation.

Part Two discusses the country's experience in GM corn commercialization and its impact on the country's corn sector.

Part Three discusses the role of agrochemical TNCs in the promotion of GMOs, their interests in the global food chain including lobbying efforts both in their home countries and the international arena in the approval of any international regulation or protocols that would have an effect in the promotion and the liberalization of GMOs across countries.

Part Four discusses the results of field research conducted in selected GM corn-producing provinces in Luzon, Visayas and Mindanao. It also discusses the interplay of sectors in the corn industry, including the agrochemical TNCs and their local counterpart, the players in GM corn production, trade and marketing, as well as government's role in the promotion of the use of GM corn in support of its full-scale countrywide commercial production.

Part Five presents the local struggles against GM crops propagation in the country.

Finally, **Part Six** provides the conclusion and recommendations for policy alternatives.

I. Biotechnology in the Philippines

Biotechnology is a set of techniques that involves the use of biological processes and living organisms for industry, agricultural or other activities. Its purpose is to modify the natural and biological processes of living organisms without necessarily altering the genes or genetic construct of the living organisms. It has four major industrial processes based on biological systems, namely cell and tissue culture, fermentation, enzyme technology, and genetic engineering – also referred to as modern biotechnology.[1] [2]

Genetic engineering or recombinant DNA (deoxyribonucleic acid) technology differs from other forms of biotechnology as it allows the isolation and transfer of genes coding specific characteristics between living organisms to produce a new living organism that expresses the desired characteristics of both organisms.[3] [4]

Genetically modified organisms or GMOs is the common term used for genetically engineered organisms.[5]

GMOs: Gene Revolution

Modern biotechnology or genetic engineering is said to be one of the major technological advances in the 1980s that ushered in a new era of industrial revolution – the other one being information technology or IT.[6] GMOs are then to be the centerpiece of a new wave of green revolution promoted by developed countries and TNCs purportedly to solve the problem of low productivity and hunger among the poor population especially in underdeveloped countries.

Modern biotechnology is a multi-billion dollar technology that has benefited TNCs especially those in the so-called life sciences industry, led by Monsanto of the US which has pioneered in the research and development (R&D) of GMOs in the last decades. The most successful are GM crops such as GM soybean, GM corn, and GM cotton. GM crops are the most lucrative products of modern biotechnology because these are agricultural crops widely consumed by the global population.[7]

Genetic engineering has earned huge profits for leading biotechnology centers in the US, Europe, Canada and Australia, with an aggregate net profit of US$4.7 billion in 2010. R&D meanwhile has reached US$22.8 billion.[8]

The sale of GMO seeds alone in 2010 was valued at US$11.2 billion. In the last 15 years that GMOs were being planted, from 1996 to 2010, total accumulated

seeds sales reached US$73.5 billion. These figures are only for the sale of seeds and licensing revenues and do not include sales from chemicals such as herbicides, among others.[9]

Biotechnology in the Philippines

The Philippines has always been involved in agricultural research by virtue of it being the host of the International Rice Research Institute (IRRI). The Institute of Plant Breeding (IPB) at the University of the Philippines Los Baños (UPLB) is the one mainly involved in agricultural research producing numerous crop varieties.

The first R&D institute on biotechnology was established at UPLB in 1979. Through the Letter of Instruction No. 1005 from then president Ferdinand E. Marcos issued on March 1980, the National Treasury released Php10 million to fund the establishment of the National Institutes for Applied Microbiology and Biotechnology, now known as National Institute of Molecular Biology and Biotechnology (BIOTECH), mandated to apply biotechnology research to develop industrial processes and improve food production and food processing.[10 11]

In 1986, the Department of Science and Technology (DOST) declared biotechnology as one of the leading edge technologies and was one of the major research areas supported by the newly established Philippine Council for Advanced Sciences Research and Development (PCASTRD). Majority of R&D projects in BIOTECH and PCASTRD, however, focused on traditional biotechnology.

In 1990, Executive Order (EO) 430 was issued creating the inter-agency National Committee on Biosafety of the Philippines (NCBP). The members of the NCBP initially were the DOST, DA, the Department of Health (DOH), and the Department of Environment and Natural Resources (DENR).[12] The creation of the NCBP was in response to the entry of new strains of rice pathogens for research (rice blast), and so its guidelines which were formulated in 1991 focused only on the regulation of traditional biotechnology. In 1998, the guidelines crafted for biosafety evolved to cover research activities on GMOs.

Until 2002, the NCBP was the sole regulatory body overseeing biosafety in the country, including regulating contained and confined as well as open field trials. With the issuance of DA Administrative Order No. 8 in April 2002, however, field trials and release were transferred under the regulation of the DA-BPI while confined testing remained with the NCBP.

EO 514 or the National Biosafety Framework was issued in 2006, which strengthened the role of NCBP in the regulation of GMOs. The Department of Interior and Local Government (DILG), Department of Trade and Industry (DTI), Department of Foreign Affairs (DFA), and appointed representatives from the public and private sectors have been included as members of the NCBP.

Today in collaboration with public and private institutions both local and abroad, biotechnology research for the development of GM crops is being conducted in the country, with the Philippines being considered as a leader in biotechnology in Asia and a 'model' for other countries in the aspect of biosafety regulations.

Philippine Biosafety Guidelines

The NCBP follows the Philippine Biosafety Guidelines issued in 1998. It originated from the report in 1997 of the ad-hoc committee on biosafety composed of representatives from the UPLB, IRRI and DA, which in turn was patterned after the biosafety guidelines of Australia, US, and Japan.

The Philippine Biosafety Guidelines covers work involving genetic engineering and activities requiring the importation, introduction, field release and breeding of non-indigenous or exotic organisms even though these are not genetically modified. Its contents include the organizational structure for biosafety; procedures for evaluation of proposals with biosafety concerns; procedures and guidelines on the introduction, movement and field release of regulated materials; and physico-chemical and biological containment and procedures.

The country's guidelines are based on the international protocols that the Philippines had ratified, such as the United Nations Convention on Biological Diversity, Philippine-ratified on October 8, 1993, and the Cartagena Protocol on Biosafety on August 14, 2006.

For GM crops, there are three levels of regulation: under laboratory/greenhouse/screenhouse test which is the mandate of DOST-NCBP; field test either single or multi-location which is the mandate of DA; and the propagation or commercial stage which is also under the DA.[13]

DA AO No. 8 of 2002 is the sole basis on the commercialization of GMOs which provide rules and regulation on the importation and release into the environment of plants and plant products derived from the use of genetic engineering.

GMOs in the Philippines

The DOST-NCBP is the agency responsible for issuing the permit for testing in confined or contained environment. The DA-BPI, on the other hand, is responsible for issuing the required permits for field testing and propagation and commercialization.

The DA AO No. 8 covers the following concerns:

1. Regulation of the importation, use and commercial propagation of GM crops
2. Requires step by step introduction of GM crop into the environment
3. All GM crops intended for planting
   a. must undergo experiments under contained use
   b. must undergo field trials in the Philippines

In field testing, the article should have been tested under contained conditions in the Philippines. In propagation, the article, after having been field tested, should show that it would not pose any significant risks to the environment and human and animal health. If the regulated article is a pest-protected plant, it should be duly registered with the Fertilizer and Pesticide Authority (FPA).

Importation either for direct use as food or feed or for processing should be duly authorized by the BPI. DA AO No. 8 also states that no article shall be allowed for importation unless it has been *"authorized for commercial distribution as food or feed in the country of origin and it poses no significant risks to human and animal health."* The BPI also requires for all shipments of regulated articles to the Philippines be accompanied by a corresponding declaration of GMO content.

All GMOs that passed the BPI risk assessments are listed in its approval registry available at its website. As of February 12, 2012, there are eight regulated GMOs approved for propagation, all of which are GM corn (Table 1). These include two insect-resistant corn (the Bt corn, resistant to the Asian Corn Borer), two herbicide-tolerant (HT) corn (resistant to glyphosate), two stacked corn varieties (BT/RR or roundup ready), one advanced BT (MON 89034) or the so-called pyramided variety corn, and one stacked corn (advanced BT x herbicide tolerant). "Pyramided" means more than two genes were incorporated into the corn variety while "stacked" pertains to GMOs containing two genes. Meanwhile, "transformation events" pertain to the process that transfers the desired gene into the recipient organism.[14]

At present, GMOs approved for direct importation for use as food and feed or for processing include 32 single transformation events and 27 stacked genes. These include GM soybean, corn, potato, cotton, alfalfa, canola and sugarbeet. In total, about 67 GMO crops

Huge tracts of land dedicated to the planting of Bt corn in the town of Bayambang, Pangasinan.

Table 1. GMOs Approved for Propagation in the Philippines (as of February 23, 2012)

Transformation Event*	Introduced Trait and Gene	Date Approved	Technology Developer
1. Corn GA 21	Contains modified epsps gene from corn which confers tolerance to herbicides	11/24/2009	Syngenta Philippines
2. Corn MON810	Contains cry1Ab gene from Bacillus thuringiensis var kurstaki which confers resistance to corn borer	12/3/2007 (renewal)	Monsanto Philippines
3. Corn NK603	Contains cp4epsps coding sequence from Agrobacterium sp. CP4 strain which confers tolerance to the Roundup family of agricultural herbicides	03/16/2010 (renewal)	Monsanto Philippines
4. Corn Bt 11/a	Contains the cry1Ab gene from Bacillus thuringiensis and pat gene from Streptomyces viridochromogenes which confers resistance to corn borer and tolerance to herbicide, respectively	04/23/2010 (renewal)	Syngenta Philippines
5.Corn MON89034/b	Contains the cry1A.105 cry2Ab2 genes from Bacillus thuringiensis that are active against lepidopteran insects	11/19/2010	Monsanto Philippines
6.Corn Bt11 x Corn GA21/c	Contains the cry1Ab gene from Bacillus thuringiensis and pat gene from Streptomyces viridochromogenes which confers resistance to corn borer and tolerance to herbicide respectively and modified epsps gene from corn which confers tolerance to herbicides	6-Sep-10	Syngenta Philippines
7. Corn MON89034 x Corn NK603/c	Contains two genes (cry1A.105 and cry2Ab2) from Bacillus thuringiensis which protect the plant from Asiatic corn borer, common cutworm and corn earworm and cp4epsps coding sequence from Agrobacterium sp CP4 strain which confers tolerance to the Roundup family of agricultural herbicides. ~~Contains the cry1A.105 and cry2Ab2 genes from Bacillus thuringiensis that are active against lepidopteran insects and cp4epsps coding sequence from Agrobacterium sp. CP4 strain which confers tolerance to the Roundup family of agricultural herbicides	4-Mar-11	Monsanto Philippines
8. Corn MON810 x Corn NK603/c	Contains cry1Ab gene from Bacillus thuringiensis var kurstaki which confers resistance to corn borer and cp4epsps coding sequence from Agrobacterium sp. CP4 strain which confers tolerance to the Roundup family of agricultural herbicides	7/16/2010 (renewed)	Monsanto Philippines

* Transformation events approved for propagation are also approved for direct use for food and feed or for processing.
/a Advanced Bt
/b Pyramided - contains four or more genes from different organisms
/c Stacked or combined varieties - contains genes from two different organisms

Source: Bureau of Plant Industry

were approved by the DA-BPI for food, feed and for processing. All regulated GMOs are given a five-year permit for commercialization and propagation. After five years, the permit may be renewed for another five years, without clear basis for extension of the permit granted.

Meanwhile, there are 13 GMOs approved for field testing.

The DA approved the commercial propagation of Bt corn or MON 810 of Monsanto on December 4, 2002. Since 2003, the hectarage devoted to Bt corn increased from 10,679 to 685,317 hectares (has.) in 2011. Genetic traits were added to the Bt corn that made it resistant to herbicides particularly Monsanto's signature Roundup Ready herbicide (glyphosate).

Questioning the Regulatory Process

Despite being touted as the regional leader in biotechnology policy and regulation, the Philippine government is at the center of criticisms for lacking transparency and accountability when it comes to GMOs. Civil society organizations (CSOs) including anti-GMO activists, consumers, and even government officials in agencies supposedly involved in the regulatory process observe flaws in the current biosafety regulatory system. Questions center on the granting of permits and the legality of the whole process of approval. There seems to be an apparent lack of understanding of the respective roles by government agencies involved. There is also the general lack of knowledge among farmers, including even local government officials, on the effects of planting the GM corn.

Table 2. GMOs Approved for Field Testing in the Philippines (as of July 6, 2011)

Proposal	Technology Developer	Date Approved
1. Demonstration of Weed Control Performance of Roundup Ready Corn (RRC) System DK818 NK603 vis-a-vis Farmers' Practices	Monsanto Philippines	Nov. 26, 2004
2. Performance of Roundup Herbicide (360 g ae/L IPA Salt) Against Weeds in Glyphosate-Tolerant corn	Monsanto Philippines	Nov. 26, 2004
3. Field Verification of the Agronomic Performance of the Transgenic Corn (Zea mays L.) Hybrid Stacked (NK603/MON810) Expressing the Bacillus thuringiensis Cry1Ab Protein for Resistance against the Asiatic Corn Borer (Ostrinia furnacalis Guenee) and CP4EPSPS for Tolerance Against the Herbicide Roundup	Monsanto Philippines	Dec. 10, 2004
4. Performance of Herculex 1 Bt Transgenic Corn Hybrids Against Asiatic Corn Borer (Ostrinia furnacalis Guenee) Under Field Conditions in the Philippines	Dow AgroSciences	2-May-06
5. Field Testing of Transgenic Papaya with Delayed Ripening Trait	Institute of Plant Breeding - Crop Science Cluster, UP, Los Baños, Laguna	Mar. 20, 2007
6. Multi-location Field Efficacy Verification Trial of Herbicide Tolerant Maize Expressing Event GA21 Against Glyphosate Herbicide in the Philippines	Syngenta Philippines	Nov. 19, 2007
7. Agronomic Equivalency Trial of MON89034 Hybrids with Regulatory Framework in the Philippines	Monsanto Philippines	Aug. 1, 2008
8. Field Verification of the Agronomic Performance of Transgenic Corn (Zea mays L.) line MON89034 Expressing the Bacillus thuringiensis Cry1A.105 and Cry2Ab Proteins for Efficacy Against Lepidopterous Pest of Corn	Monsanto Philippines	Aug. 1, 2008
9. Field Verification for the Agronomic Performance of Stacked Hybrid Corn (Zea mays L.) MON89034 x NK603 Expressing the Bacillus thuringiensis Cry1A.105 and Cry2Ab2 Proteins for Efficacy Against Lepidopterous Pests of Corn and CP4EPSPS for Tolerance of Round up Herbicide	Monsanto Philippines	Aug. 1, 2008
10. Multi-location Field Efficacy Trial of Corn Hybrid Expressing the Stacked Trait BT11 x GA21 Against the Asiatic Corn Borer and Glyphosate Herbicide in the Philippines	Syngenta Philippines	Oct. 28, 2009
11. Development and Commercialization of Philippine Fruit and Shoot Borer (FSB) Resistant Eggplants Containing MAHYCO Bt Eggplant Event, EE-1: Multi location Field Trials for Biosafety Assessment, Variety Accreditation and Fertilizer and Pesticide Authority (FPA) Registration	University of the Philippines Los Baños	Mar. 16, 2010 and Jun 28, 2010
12. Field Verification of the Agronomic Performance of Transgenic corn (Zea mays L.) Line TC1507 Expressing the Bacillus thuringiensis Proteins for Efficacy Against Asiatic Corn Borer and the PAT Proteins for tolerance to Glufosinate /a Herbicide	Pioneer Hi-Bred Philippines	19-Apr-11
13. Field Verification of the Agronomic Performance of Transgenic Corn (Zea mays L.) Hybrid Stacked (TC1507 x MON810 x NK603) Expressing the Bacillus thuringiensis Proteins for Efficacy Against Asiatic Corn Borer and the Proteins PAT and CP4-EPSPS for Tolerance to Glufosinate /a and Glyphosate Herbicides	Pioneer Hi-Bred Philippines	19-Apr-11

/a considered as "slightly hazardous" by the World Health Organization (WHO). It is 'persistent' and 'mobile' when released in the environment, in the soil and water; toxic to a number of aquatic animals including the larvae of clams and oysters(29), daphnia and some freshwater fish species .

Source: Bureau of Plant Industry

Ten years after the approval of the first GMO release, the government has yet to finalize the Manual on Biosafety Decision Making Process drafted in 2006 by virtue of EO 514. The manual targeted the active involvement of different government agencies strategic to the effective monitoring of GMOs in the country. Procedural guidelines have yet to be approved after undergoing four revisions and various consultations, the most recent ones having been done in the first quarter of 2012.

For example, EO 514 mandates the DENR to conduct monitoring under Section 4.9, to wit: *"The DENR shall ensure that environmental assessments are done and impacts identified in biosafety decisions. It shall also take the lead in evaluating and monitoring regulated articles intended for bioremediation, the improvement of forest genetic resources, and wildlife genetic resources".* However, according to the Ecosystems Research and Development Bureau (ERDB) of the DENR, only when the manual is approved shall the DENR do its assignment on environmental risk assessment and monitoring.[15] Moreover, the ERDB said that DENR has no role in the implementation of the DA AO No. 8 when ironically the DA AO No. 8 provides the guidelines on the monitoring of field testing, multi-location and propagation of GM crops.[16]

At present, it is the DA's Bureau of Plant Industry and Plant Quarantine Service which is in charge of the

Table 3. Aggregate Data of GE Corn Planted 2003-2010 (hectares)

YEAR	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bt Corn									
LUZON	10,158	48,516	43,735	85,702	103,438	68,301	38,507	37,115	
VISAYAS	24	534	445	405	2,551	298	0	0	
MINDANAO	587	10,706	5,829	10,693	16,604	13,053	9,516	3,120	
Total	10,769	59,756	50,009	96,800	122,593	81,652	48,023	40,235	21,007
RR Corn									
LUZON				11,685	54,509	5,471	3,518	642	
VISAYAS				4,424	8,925	4,571	2,790	0	
MINDANAO				10,384	56,589	41,443	40,501	8,048	
Total				26,493	120,023	51,485	46,809	8,690	15,038
Stacked (Bt + RR)									
LUZON				3,879	59,346	158,520	183,771	373,079	
VISAYAS				232	2,472	7,074	8,006	5,366	
MINDANAO				469	9,461	48,844	40,618	115,153	
Total				4,580	71,279	214,438	232,395	493,598	643,808
Pyramided									
Total									5,464
GRAND TOTAL	**10,769**	**59,756**	**50,009**	**127,873**	**313,895**	**347,575**	**327,226**	**542,522**	**685,317**

Source: Bureau of Plant Industry

post-commercial monitoring. The DOST Biosafety Committee on the other hand is in charge of regulating the greenhouse testing. The DENR has not done any post monitoring of field-tested GMOs or planted at commercial scale in relation to biodiversity and the environment. The DOH has also not done any post release monitoring on the impact of GM corn on the farmers and their families who consume GM corn as food.

Even at the BPI level, no post release monitoring has ever been done in the last 10 years of the commercialization of the GM corn. Monitoring is supposed to be done by the BPI-Biotech Core Team (BPI-BCT). According to the BPI-BCT, they have only limited personnel and cannot possibly conduct post release monitoring unless there is request from the farm level for an assessment.[17]

Meanwhile, even the FPA does not have approval and regulatory guidelines especially for pesticide protected plants (PPPs) such as Bt corn. These are yet to be finalized as nowhere in its so-called *green book* (implementing guidelines for PD 1114 that created the FPA) are PPPs found. The BPI-BCT has assigned a staff at the FPA to do regulatory assessment of PPPs submitted by agrochemical TNCs. But the staff does not have the technical qualifications required to conduct the assessments and approval.[18]

Even officials of the Bureau of Animal Industry (BAI), which supposedly has a role in the regulation of GM feeds, seem to be not aware of their specific roles in regulating and monitoring GMOs. The BAI cannot even categorically say that it has been consulted on GM crops as feeds.[19]

After a decade, only the BPI is involved in GMO regulation and monitoring. The DA apparently is not keen on involving other government agencies. Industry players are quite content with this situation. However, damning evidences and experiences about the GM technology have been recorded throughout the globe, and calls for safety studies persist. Things are happening fast, yet the Philippine government has not done a systematic assessment of GMO commercialization.

Corn is being planted by using either feet or seed planting tools so-called "armalite" or "jabber".

Endnotes

[1] "Genetic Engineering and Genetically Modified Organisms in Agriculture". MASIPAG, September, 2000, Second Version, page 18 of 67 pages.

[2] "Transnational Corporations in Biotechnology". United Nations Centre on Transnational Corporations, New York 1988, page 8 of 34 pages. Accessed at http://unctc.unctad.org/data/e88iia4a.pdf

[3] "Transnational Corporations in Biotechnology", 1988, Ibid., page 2; italicized word supplied by IBON; A more technical definition would be "the application of (a) in vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) or direct injection of nucleic acid into cells or organelles; or (b) fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques of traditional breeding or selection" characteristic of so-called conventional hybrid crops. Italicized words supplied by IBON, see Executive Order 514 strengthening the National Biosafety Committee of the Philippines (NCBP), issued in 2006.

[4] DNA contains the biological instructions that make each species unique. DNA, along with the instructions it contains, is passed from adult organisms to their offspring during reproduction. Each DNA sequence that contains instructions to make a protein is known as a gene. The size of a gene may vary greatly, ranging from about 1,000 bases to 1 million bases in humans. DNA contains the instructions needed for an organism to develop, survive and reproduce. To carry out these functions, DNA sequences must be converted into messages that can be used to produce proteins, which are the complex molecules that do most of the work in our bodies. Recombinant DNA (rDNA) is made of segments of DNA (polymers of deoxyribonucleotides) from two or more sources. Nature has been recombining DNA in living cells for eons, but humans have only recently discovered the means to carry out this operation in the test tube. The procedure used for preparing recombinant DNA or rDNA is referred to as genetic engineering. See http://www.genome.gov/25520880/ and http://www.chemistryexplained.com/Pr-Ro/Recombinant-DNA.html#b

[5] The Cartagena Protocol on Biosafety, which embodies the international rules and procedures governing genetically engineered organisms refers to GMOs as living modified organisms of LMOs. For the purposes of discussion, we shall refer to these genetically engineered organisms as GMOs.

[6] United Nations Centre on Transnational Corporations, 1988, page 8 of 34 pages.

[7] Life science became so-called as large TNCs in the pharmaceutical and agrochemical industries merged as they focused on biotechnologies. They later on re-divided their operations while remaining in their mergers. See Howard, Philip H. "Visualizing Consolidation in the Global Seed Industry: 1996-2008", in Sustainability Journal, Published 8 December 2009. Accessed at http:// www.mdpi.com/journal/sustainability

[8] Earnst and Young, "Beyond Borders: Global Biotechnology Report 2011. Accessed at http://www.ey.com/GL/en/Industries/Life-Sciences/Beyond-borders--global-biotechnology-report-2011

[9] **James, Clive.** "Global Status of Commercialized Biotech/GM Crops: 2010". *ISAAA Brief* No. 42. Published by The International Service for the Acquisition of Agri-biotech Applications (ISAAA), copyright 2010, page 222 of 279 pages. Accessed at http://www.isaaa.org/resources/publications/briefs/42/download/isaaa-brief-42-2010.pdf

[10] See http://old.uplb.edu.ph/biotech/aboutus

[11] "The National Biosafety Framework for the Philippines". Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau. 2004. Quezon City, Philippines, page 16 of 77 pages. Accessed at… See also **Richmond, Christina L.** "Genetically Modified Crops In The Philippines: Can Existing Biosafety Regulations Adequately Protect The Environment?". Copyright © 2006 Pacific Rim Law & Policy Journal Association, 30 pages); and Corpuz, Jennifer. 'Integrating Issues of Ethics, Socio-economics and Sustainability in Philippine Policy on GMOs and Regulations on Biosafety' in "Indigenous Peoples of the Philippines: Addressing Traditional Knowledge, Food Security, Mining and GMOs". Volume VII, No. 2, Indigenous Perspectives, Copyright 2005 by the Tebtebba Foundation, 121 pages. Accessed at http://www.google.com.ph/search?rlz=1C1CHJW_enPH468PH468&sourceid=chrome&ie=UTF-8&q=Indigenous+Peoples+of+the+Philippines%3A+Addressing+Traditional+Knowledge%2C+Food+Security%2C+Mining+and+GMOs

[12] Ibid.

[13] **Sinohin, Veronica O.,** Supervising Science Research Specialist, TDD-ERDB and Alternate representative to the DOST-Biosafety Committee. Answered queries via e-mail, April 11, 2012.

[14] BPI Biotech Core Team, interview with Ms. Thelma Soriano, April 11, 2012

[15] Sinohin, Veronica O., April 11, 2012

[16] Ibid

[17] BPI Biotech Core Team, April 11, 2012

[18] Informal interviews with FPA Senior Officials, April 4 and 10, 2012.

II. GM Corn Commercialization

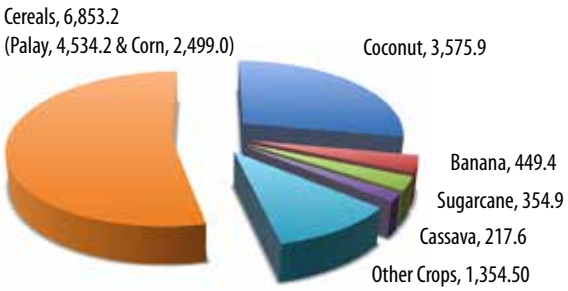
The Philippines, which produces about 6.9 million metric tons (MMT) of corn annually is the only country in Asia to approve and grow a major biotech feed crop – the GM corn. According to the International Service for the Acquisition of Agri-Biotech Applications (ISAAA), the country has also achieved the biotech mega-country status, whatever that means, with its production of GM corn over more than 50,000 hectares or more since 2004, as corn farmers started planting the GM corn since 2003.[1]

Profile of the corn sector

Corn (*Zea mays*), or maize in the international market, is the third most widely planted agricultural crop in the Philippines. Total area planted to corn covered roughly 2.5 million hectares in 2010 or about 19.5% of total agricultural land. **(Figure 1)** This however covers the total area planted for the two cropping seasons annually. Actual corn area is 1.5 million hectares in 2010.[2]

Bureau of Agriculture Stastics (BAS) 2010 data show that corn contributed Php18.8 billion to the country's gross value added (GVA) at constant prices or about 12.5% of the country's total agricultural production. At current prices, corn contributed Php69.7 billion to the Philippine economy in 2010, which increased by 25.6% to Php87.6 billion in 2011. Meanwhile, estimates place the number of corn farmers at 1.8 million.[3]

Figure 1. Distribution of Agricultural Land By Crop, 2010 (in thousand hectares)

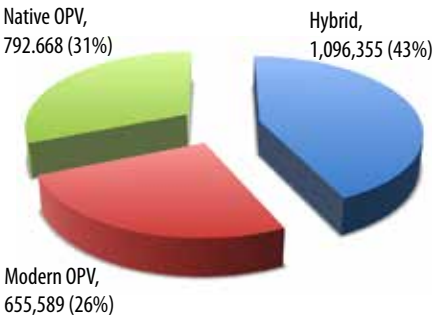


Source: Bureau of Agricultural Statistics

The country produces both white and yellow corn. Historically, the total production and area devoted to white corn were much larger than yellow corn. With the growing demand for yellow feed corn for the expanding livestock and poultry industries, production and area devoted for yellow corn increased

especially with the introduction of open pollinated varieties (OPVs). The OPVs were later replaced by hybrid varieties aggressively marketed by private seed companies and local traders.[4] As of 2011, hybrid varieties of corn comprised 43% of total area planted to corn while native/traditional OPVs comprised 31 percent. **(Figure 2)**

Figure 2. Philippines Corn Area Harvested (%GM Corn), 2011



Over the period 1970-2009, yellow corn area hectarage grew at an annual average of 5.48 %, while white corn hectarage declined annually by 0.63 percent. Yellow corn yield grew annually by 3.94%, while that of white corn grew annually by 1.79 percent. **(Tables 4 and 5)**

Productivity per hectare for yellow corn between 2000 and 2009 was 0.88 MT per hectare while that of white corn was 0.45 MT per hectare. Yellow corn productivity grew albeit slightly in 20011 from 2009 by 0.14 MT per hectare while productivity for white corn was only 0.02 MT per hectare.

White corn is considered the country's secondary staple. It is milled into grits, which are boiled together with rice or separately. Corn grits or *kalimbugas* are preferred over rice in many places as Cebu, Samar, Leyte, and parts of Mindanao.[6]

Before the introduction of OPVs and yellow hybrid corn, corn grits was the staple for as many as 20% of the population, but this has dwindled since the 1990s. In 2010, the share of net food disposable for corn was 12.5 percent.[7] **(Table 6)**

Yellow corn on the other hand is largely used and traded as raw material for animal feeds or as feed crop. Almost 70% of national production of yellow corn is used for feeds. The rest is used for food processing (oil, starch, snacks) and ethanol manufacturing.[8] **(Table 7)**

Box 1 : Corn Types

Traditional or Native Corn Varieties – have good eating and milling qualities. They have tolerance to the common pests and diseases especially downy mildew disease and do not require fertilizers and chemical sprays. They are adapted to marginalized soils.

Improved or Modern OPVs – in the form of synthetics or composites are developed by state universities such as the UPLB and University of Southern Mindanao, which to some extent replaced the traditional native varieties.

Corn hybrids – are products of global private seed TNCs like Monsanto, Syngenta, Pioneer and Cargill, including domestic seed companies like East-West, Corn World and Bioseed. These varieties are bred for high yields, large corn ears, responsiveness to fertilizers, resistance to lodging, tolerance to diseases like downy mildew, and high shelling recovery. About 90% of the total hectarage for yellow corn is now planted to hybrids. A good part of the hybrid corn plantings is GM corn with Bt and glyphosate-tolerant genes.[5]

Yellow corn is preferred over white corn as feeds because of its high protein content compared to white corn. The country also has traditional varieties of yellow corn including red/violet corn.[9] [10]

Demand for yellow corn

Yellow corn production is significant to the country's agricultural sector as it is a major ingredient for feeds utilized by the country's livestock and poultry sectors,

White corn or *kalimbugas* as an alternative staple to rice.

Table 4. Average Growth (in %) in Corn Hectarage, 1970-2010

Area Harvested	2009/2010	1970-79	1980-89	1990-99	2000-2009	1970-2009
White	(4.56)	3.18	0	(4.77)	(0.93)	(0.63)
Yellow	(9.44)	6.14	10.84	0.84	3.43	5.48
All Corn	(6.89)	3.36	1.55	(3.03)	0.70	0.65

Source: Bureau of Agricultural Statistics

Table 5. Average Growth (in %) in Corn Yield (metric ton / hectare), 1970-2010

Yield/hectare	2009/2010	1970-79	1980-89	1990-99	2000-2009	1970-2009
White	1.89	1.87	1.28	0.59	3.43	1.79
Yellow	1.51	1.41	6.25	5.21	2.87	3.94
All Corn	(2.64)	1.72	2.52	3.59	4.37	3.05

Source: Bureau of Agricultural Statistics

Table 6. Rice and Corn Net Food Disposable (NFD) and Per Capita NFD

Yield/hectare	Rice		Corn		Share of Corn /a
	NFD ('000 mt)	Per Capita NFD (kg/yr)	NFD ('000 mt)	Per Capita NFD (kg/yr)	
1991	5,263	83.71	1,059	16.84	16.8
2001	7,892	103.16	1,421	18.57	15.3
2010	10,601	112.76	1,520	16.17	12.5

Source: Bureau of Agricultural Statistics

Table 7. Corn Supply and Demand

ITEM	Volume ('000 MT)										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL SUPPLY	**5,800**	**6,016**	**6,146**	**6,213**	**6,387**	**7,227**	**7,711**	**7,815**	**8,669**	**7,689**	**8,295**
Beginning Stock	190	177	236	211	192	204	177	173	198	254	153
Production	4,525	4,319	4,615	5,413	5,253	6,082	6,737	6,928	7,034	6,377	6,971
Imports	1,085	1,520	1,295	589	942	941	797	714	1,437	1,058	1,171
Corn Imports	172	278	99	23	71	307	152	23	310	96	91
Corn Substitute*	913	1,242	1,196	566	871	634	645	691	1,127	962	1,080
REQUIREMENT	**5,623**	**5,784**	**5,935**	**6,022**	**6,183**	**7,049**	**7,539**	**7,617**	**8,415**	**7,536**	**7,484**
Food	943	966	989	944	966	1,317	1,564	1,445	1,821	1,488	1,564
Seeds	50	48	48	51	49	51	53	53	54	50	52
Feeds	3,725	3,906	3,975	3,944	4,117	4,465	4,575	4,733	4,791	4,876	4,440
Wastes & Others**	905	864	923	1,083	1,051	1,216	1,347	1,386	1,749	1,122	1,428
ENDING STOCK	**177**	**232**	**211**	**191**	**204**	**178**	**172**	**198**	**254**	**153**	**811**

*Implied/assumed wheat/other corn substitutes used as feeds in corn equivalent
**Includes industrial uses

Source: Bureau of Agricultural Statistics, Livestock Development Corporation, Philippine Association of Feedmillers, Inc.

including fishery, as fish feeds. Increasing demand in the livestock (particularly hog/swine) and poultry sectors translates to an increased demand for yellow corn. Yellow corn constitutes about 50% of the volume of poultry feed and 40% of hog feed.

The corn-livestock-poultry integrated industries contributed Php335.48 billion or 26.95% of GVA to the Agriculture, Fishery and Forestry (AFF) sector in 2011 at current prices. **(Table 8)**

Government data show that local production of yellow corn however has not been enough to supply and satisfy the demand for animal feeds in the country. The country has been importing substantial volumes of yellow corn and feed wheat, which is considered as cheaper substitute for yellow corn, to fill in the deficit in local production which in the last 10 years from 2001 to 2010 averaged 31%. **(See Table 9)** Production for feeds has been erratic over the last decade owing to the recent abnormal weather patterns attributed to climate change. It was only in 2011 that the country experienced a surplus in the local supply of yellow corn for feeds.[11]

Another GM corn developed after the Bt corn was Monsanto's herbicide resistant (Roundup Ready) corn. Later on, Monsanto developed the stacked trait of Bt and Roundup herbicide resistance. **(See Box 2)**

GM corn propagation

Since the official commercialization of Bt corn and the succeeding GM corn varieties developed, planted area has expanded from only 10,769 has. in 2003 to 685,317 has. in 2011. This is equivalent to an annual average increase of 84,319 hectares from 2003 to 2011. In 2010, total GM corn area accounted for roughly 22% of corn areas, compared to the 12% share in 2009. In 2011, this increased further to 26.93% of total corn areas. It is also important to note that the stacked variety has outpaced the single trait variety **(Table 10).**

GM corn production however is not quantified in the government data. Data shows only aggregate data of hybrid yellow corn production where GM corn is lumped together with non-GM hybrid yellow corn. Annual hybrid yellow corn production is at 3.6 to 4.2 MMT with an average yield of 3.85 to 4.06 tons per hectare from 2010 to 2011 respectively **(Table 11).**[12]

Isabela ranks first in yellow corn production with 1.02MMT production for 2011 or 21.24% of total in 2011. Maguindanao, on the other hand is number one in white corn producing with 425,741MT or 19.8% of total. **(Table 12)**

When it comes to GM corn area planted, Isabela leads with 237,954.5 ha in 2011 or roughly 35% of total GM corn areas in the Philippines. The top 10 GM corn

Table 8. Gross Value Added (GVA) in Agriculture, Fishery and Forestry, 2010-2011

Industry Group	CURRENT PRICES (In Billion Php)				CONSTANT PRICES (In Billion Php)			
	2010	2011	% Growth	% Share to GVA	2010	2011	% Growth	% Share to GVA
1. AGRICULTURE	**1,106.28**	**1,240.64**	**12.14**	**99.68**	**659.99**	**675.79**	**2.39**	**99.38**
a. AGRICULTURE	926.15	1,057.20	14.15	84.95	523.56	544.82	4.06	80.12
Palay	221.14	243.60	10.11	19.57	122.97	130.25	5.92	19.15
Corn	60.58	76.65	26.51	6.16	34.59	37.88	9.50	5.57
Coconut	76.86	117.71	53.16	9.46	29.90	29.31	-1.98	4.31
Sugarcane	27.35	38.29	40.01	3.08	11.41	18.22	59.72	2.68
Cassava	12.10	14.32	18.29	1.15	7.87	8.26	5.06	1.22
Other Crops	202.14	225.66	11.63	18.13	110.75	108.98	-1.60	16.03
Livestock	150.33	152.00	1.11	12.21	90.48	92.26	1.96	13.57
Poultry	101.85	106.83	4.89	8.58	68.26	71.26	4.40	10.48
Activities & Services	73.71	82.15	11.45	6.60	47.35	48.41	2.24	7.12
b. FISHERY	180.14	183.44	1.83	14.74	136.43	130.97	-4.00	19.26
2. FORESTRY	**2.44**	**3.93**	**61.52**	**0.32**	**2.68**	**4.20**	**57.10**	**0.62**
GVA in Agriculture, Fishery & Forestry	**1,108.72**	**1,244.57**	**12.25**	**100.00**	**662.67**	**680.00**	**2.62**	**100.00**

Source: National Statistics Coordinating Board

Table 9. Feed Grains: Supply and Demand, 2001-2011

YEAR	Volume ('000 MT)				Self Sufficiency (a/b)
	Local Demand (a)	Local Supply (b)	Yellow Corn Import	Feed Wheat Import	
2001	3,725	2,216	172	913	59
2002	3,906	2,144	278	1,242	55
2003	3,975	2,178	99	1,196	55
2004	3,944	2,708	23	566	69
2005	4,117	2,551	71	871	62
2006	4,465	3,163	307	634	71
2007	4,575	3,578	152	645	78
2008	4,733	3,972	23	691	84
2009	4,791	4,010	310	1,127	84
2010	4,876	3,431	96	962	70
2011	4,440	4,821	91	1,200	109

Source: Bureau of Agricultural Statistics, Livestock Development Corporation, Philippine Association of Feedmillers, Inc.

Box 2: Bacillus thuringensis and Roundup Herbicide

The Bt pesticide comes from the soil bacteria - Bacillus thuringensis that creates a lethal poison Bt-toxin which kills specific insects. In its natural form, it is used in organic and conventional agriculture and forestry. Scientists take the bacterial gene, make changes so it will work in plants, and then put it into plant DNA so that every cell of the plant creates the toxin. Also, the natural BT pesticide molecule has a safety catch on it, keeping it inactive. Once it gets inside an alkaline stomach of the Asiatic Corn Borer (or any insect sensitive to the Bt toxin), the safety catch is removed and it then destroys the stomach lining of the pest and kills it. When scientists prepare the Bt gene for plants, however, they change it so the molecule no longer has the safety catch. It is immediately active. The Bt gene is also incorporated in eggplant and rice targeted for commercialization by 2013.

The foreign genes of the Roundup ready crops to survive herbicide spraying (with glyphosate as the active ingredient) come from the Petunia flower or from Agrobacterium sp., which naturally overproduces the element responsible for the herbicide action. In the field, while the weeds and other plants are killed by the herbicide, Roundup Ready crops stay unaffected by constantly producing the herbicide-tolerant protein. Other than GM corn, GM cotton and GM soybeans are also resistant to Monsanto's Roundup herbicide.

Source: MASIPAG 2003; Michael Hansen, 2012.

Examples of GM corn seed bags. The Dekalb brand shows 2 logos featuring the Corn Borer Protection and the Roundup Ready trait. This states that the seed releases Bt toxins against pest and is also able to resist glyphosate application to control weeds (stacked trait variety).

Table 10. Total Area Planted to GM Corn, Philippines 2003-2011 (in hectares)

YEAR	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bt Corn	10,769	59,756	50,009	96,800	122,593	81,652	48,023	40,235	21,007
RR CORN				26,493	120,023	51,485	46,809	8,690	15,038
Stacked (Bt + RR)				4,580	71,279	214,438	232,395	493,598	643,808
Pyramided									5,464
Total GM Area	10,769	59,756	50,009	127,873	313,895	347,575	327,227	542,523	685,317
All Corn Area	2,409,808	2,527,135	2,441,788	2,570,673	2,648,317	2,661,021	2,683,890	2,499,050	2,544,612
% GM Area	0.45	2.36	2.05	4.97	11.85	13.06	12.19	21.71	26.93

Source: Bureau of Plant Industry

Pioneer signage are placed near roads to attract farmers to use their products.

Table 11. Annual Philippine Corn Production, 2010 and 2011

	2011	2010
PRODUCTION (MT)	**6,971,221**	**6,376,796**
Hybrid	4,390,780	3,740,033
Modern OPV	1,375,881	1,456,867
Native OPV	1,204,560	1,179,896
White	**2,150,222**	**2,169,103**
Hybrid	114,775	119,549
Modern OPV	927,180	957,445
Native OPV	1,108,267	1,092,109
Yellow	**4,820,999**	**4,207,693**
Hybrid	4,276,005	3,620,484
Modern OPV	448,701	499,422
Native OPV	96,293	87,787
AREA HRVSTD (ha)	**2,544,612**	**2,499,040**
Hybrid	1,096,355	985,509
Modern OPV	655,589	704,253
Native OPV	792,668	809,278
White	**1,283,701**	**1,338,943**
Hybrid	43,432	46,271
Modern OPV	490,116	519,589
Native OPV	750,153	773,083
Yellow	**1,260,911**	**1,160,097**
Hybrid	1,052,923	939,238
Modern OPV	165,473	184,664
Native OPV	42,515	36,195
YIELD/HECTARE (mt/ha)	**2.74**	**2.55**
Hybrid	4	3.8
Modern OPV	2.1	2.07
Native OPV	1.52	1.46
White	**1.68**	**1.62**
Hybrid	2.64	2.58
Modern OPV	1.89	1.84
Native OPV	1.48	1.41
Yellow	**3.82**	**3.63**
Hybrid	4.06	3.85
Modern OPV	2.71	2.7
Native OPV	2.26	2.43

Source: Bureau of Agricultural Statistics

Table 12. Top Ten Corn Producing Provinces, 2011

Rank	Yellow Corn	Volume (MT)	% Share	White Corn	Volume (MT)	% Share
	Philippines	**4,820,999**	**100.00**	**Philippines**	**2,150,222**	**100.00**
1	Isabela	1,024,186	21.24	Maguindanao	425,741	19.80
2	Bukidnon	761,951	15.80	Lanao del Sur	219,302	10.20
3	South Cotabato	370,427	7.68	Lanao del Norte	200,561	9.33
4	Cagayan	345,981	7.18	Zamboanga del Sur	101,710	4.73
5	North Cotabato	301,515	6.25	Cebu	94,734	4.41
6	Pangasinan	227,948	4.73	North Cotabato	78,432	3.65
7	Sultan Kudarat	175,306	3.64	Sarangani	65,451	3.04
8	Iloilo	138,454	2.87	Negros Oriental	63,398	2.95
9	Quirino	120,274	2.49	South Cotabato	58,291	2.71
10	Camarines Sur	117,484	2.44	Misamis Oriental	55,178	2.57

Source: Bureau of Agricultural Statistics

Table 13. Top Ten Provinces with Biggest Areas Planted with GM Corn, 2011 (in hectares)

Province	Area
Isabela	237,954.5
Cagayan	58,516.0
Pangasinan	53,856.0
Bukidnon	39,720.0
North Cotabato	38,160.0
Sultan Kudarat	32,375.0
Quirino	21,842.0
Ifugao	19,567.0
Tarlac	19,011.5
South Cotabato	17,470.0
Sub-total	**536,099.0**
Others	149,518.5
Total	**685,617.5**

Source: Bureau of Plant Industry

provinces comprise 78.2% of total GM corn areas in the country. Except for Camarines Sur and Iloilo, eight of the top yellow corn producers in the country are also the top 10 GM corn producing provinces. **(Table 13)**

The rapid expansion of GM corn area placed the country in the 13th position of 'mega-producers' of GM crops in the world. **(Figure 3)** Globally, total area planted to GM crops reached 148 million hectares in 2010 by an estimated 15.4 million farmers from the 29 countries propagating GM crops.

Better income?

The Philippine government considers the wide-scale propagation of GM corn in the country as an indication of its success and projected benefits to the economy, the smallholder corn farmers, and the environment. As such, it is targeting to increase the GM corn area by 200,000 ha in 2016.[14]

The US Department of Agriculture-Foreign Agricultural Service (USDA-FAS) estimates the number of Filipino smallholder corn farmers (average of two hectares) at 270,000 in 2010. The USDA estimates farm level economic gains from GM corn production in the period 2003 to 2009 at US$108 million (Php 4.4B), and at US$35 million (Php 1.4B) in 2009 alone.[15] Cost production and value chain analysis in major corn producing regions also estimates income gains for farmers from Php20,000 to Php50,000 per hectare.[16] **(Tables 14 and 15)** The DA meanwhile estimates an additional income from planting GM corn from 1996 to 2009 of over roughly one million hectares, translating to Php4 billion for 125,000 smallholder farmers.[17]

Other studies report that profit gains at the farm level are computed at Php10,132 (about US$180) per hectare for farmers planting Bt corn with a corresponding savings of Php168 (about US$3) per hectare in insecticide costs. In another socio-economic impact study, it was reported that the additional farm income from Bt corn was Php7,482 (about US$135) per hectare during the dry season and Php7,080 (about US$125) per hectare during the wet season of the 2003-2004 crop year. Using data from the 2004-2005 crop year, it was determined that Bt corn could provide an overall

Figure 3.

Increase over 2009

29 countries which have adopted biotech crops

In 2010, global area of biotech crops was 148 million hectares, representing an increase of 10% over 2009, equivalent to 14 million hectares.

Source: Clive James, 2010.

Biotech Mega-Countries	
50,000 hectares, or more	
USA	66.8 million
*Brazil**	25.4 million
*Argentina**	22.9 million
*India**	9.4 million
Canada	8.8 million
*China**	3.5 million
*Paraguay**	2.6 million
*Pakistan**	2.4 million
*South Africa**	2.2 million
*Uruguay**	1.1 million
*Bolivia**	0.9 million
Australia	0.7 million
*Philippines**	0.5 million
*Myanmar**	0.3 million
*Burkina Faso**	0.3 million
Spain	0.1 million
*Mexico**	0.1 million

Less than 50,000 hectares	
*Colombia**	*Egypt**
*Chile**	Slovakia
*Honduras**	*Costa Rica**
Portugal	Romania
Czech Republic	Sweden
Poland	Germany

* *Developing countries*

Farmers take a rest under the shade after harvesting corn.

Table 14. Estimated Cost and Returns of GM Corn Production, Region XII

Inputs			Logistics			Process		Harvesting		Logistics	
4 bags 18-46-0	900	3,600	Per bag	20	80	Plowing and furrowing	3,000	Shelling	1,200	Transportation Fee at P0.50/kg x 5,000)	2,500
4 bags 46-0-0	1,780	7,120	Per bag	20	80	Harrowing	3,000	Drying	1,200	Informal fees	0.02
2 bags 0-0-60	1,600	3,200	Per bag	20	40	Planting, Basal Application	1,500	Bagging/Filling	1,200		
Seeds		9,000	Per bag	10	10	Herbicide Application	250				
Pesticides/Herbicides		1,100				Off Barring	1,000				
100pcs sacks	20	2,000				General Weeding	500				
1 roll twine	80	80				Side Dressing	500				
						Hilling-up	1,200				
						Insecticide Application	300				
						Harvesting	2,000				
						Hauling	1,000				
Total Cost		**26,100**			**210**		**14,250**		**3,600**		**2,500**
Cost/kg		**5.22**			**0.04**		**2.85**		**0.72**		**0.50**
% to total		**56%**			**0.45%**		**31%**		**8%**		**5%**
Target average yield = 5.00 MT per hectare											
										TOTAL COST/KG	**9.33**
										TOTAL PRODUCTION COST	**46,660.00**
										GROSS INCOME	**68,500.00**
										NET INCOME	**21,840**
										ROI	**46.81%**

Source: Region XII, Department of Agriculture Regional Field Unit

income advantage that ranged from 5-14% during the wet season and 20-48% during the dry season. In a more recent study covering crop year 2007-2008, biotech corn increased average net profitability in nine provinces by between 4 and 7% during the wet season and between 3 and 9% during the dry season.[18]

Improved environment?

Further to the benefits of planting GM corn, proponents claim that Bt corn reduces the application of insecticide and reduces exposure of farmers to harmful chemicals. Likewise, the propagation of Bt corn and its stacked traits is said to reduce exposure of non-target organisms to insecticide based on observed incidence of more beneficial arthropods in Bt corn field trials.[19]

Based on the study done recently by Brooke and Barfoot in 2011, the planting of GM crops from 1996 to 2009 amounted to the sequestration of CO2 emissions equivalent to the CO2 emissions of 7.853 million cars. Also according to the study, pesticide spraying was reduced by 393 Million kilograms and as a result decreased the environmental impact associated with chemicals use on the area planted to biotech crops by 17.1 percent. Without biotechnology, the report notes, maintaining global production at the 2009 level would have needed an additional 3.8 million hectares of soybeans, 5.6 million hectares of corn, 2.6 million hectares of cotton, and 0.3 million hectare of canola. The total area requirement would be about 7% of the arable land in the US or 24% of the arable land in Brazil.[20]

Table 15. Projected Production Cost and Returns for GM Corn in Malaybalay, Bukidnon

COST ITEMS	Qty	Unit	Unit Price	Total Cost	P/Kg
PRODUCTION CATEGORY					
Expected Production = 6.0 MT/ha.					
A. Inputs					
1. Seeds	2	bags	4,250	8,500	
2. Fertilizers & Ameliorants					
* Complete (14-14-14)	4	bags	1,200	4,800	
* Di-Ammo Phos (18-46-0)	3	bags	1,800	5,400	
* Muriate of Potash (0-0-60)	1	bags	1,330	1,330	
* Urea (46-0-0)					
* Ammophos (16-20-0)					
*17-7-0					
* Chicken Manure (amortized for 4 cropping)	10	bags	100	1,000	
* Lime (amortized for 4 croppings)	30	bags	30	900	
3. Pesticides/weedicides/herbicides,etc.	1	bots.	1,000	1,000	
B. Labor					
1. Lime & manure spreading		MD *		0	
2. Planting	7	MD *	150	1,050	
	3	MAD **	300	900	
3. Hilling Up	2	MAD **	300	600	
4. Spraying	2	MD *	150	300	
5. Off-barring	3	MAD **	300	900	
6. Fertilizing	5	MD *	150	750	
7. Weeding	11	MD *	150	1,650	
C. Machine/Equipment/Services/Facilities					
1.Tractor (plowing)	1	passes	2,000	2,000	0.4
(harrowing)	1	Passes	2,000	2,000	
2. Sprayer				0	
3. Hauler		bags		0	
Sub-Total				33,080	
II. POST PRODUCTION CATEGORY					
A. Inputs					
1. Sacks (for corn in cobs, 2 uses)	300	pcs	10	3,000	0.6
Sacks (for grains use, 2 uses)		pcs		0	0
2. Twines	4	kg	50	200	0.04
B. Labor					
1.Harvesting	12	MD *	150	1,800	
2. In field hauling (either by tractor or manual labor)	300	Sacks	5	1,500	0.3
3. Hauling by piecework (2 moves)		Kg		0	0
4. Shelling	120	Sacks	15	1,800	
5. Drying	120	Sacks	5	600	
C. Machine/Eqpt. Services/Facilities					
1. Sheller		Sacks			
2. Solar Dryer		Kgs			
3. Truck Hauler (from farm to shelling/dryer area)		Sacks			
D. Other Costs					
1. Interest (18% pax 4 months ave.)		ha.			
2. Overhead & contingency		ha.			
Sub-Total				8,900	
GRAND TOTAL				41,980	7.00
RETURNS					
Sales	6,000	Kg	11.5	69,000	
NET INCOME				27,020	4.50
ROI				64%	

*** MD = man days**
*** MAD = man and animal days**

Source: Region X Department of Agriculture Regional Field Unit

Endnotes

[1] **James, Clive.** "Global Status of Commercialized Biotech/GM Crops: 2010". *ISAAA Brief* No. 42. Published by The International Service for the Acquisition of Agri-biotech Applications (ISAAA), copyright 2010, page 151 of 279 pages. Accessed at http://www.isaaa.org/resources/publications/briefs/42/download/isaaa-brief-42-2010.pdf

[2] Data based on 2nd cropping in 2010 from the Bureau of Agricultural Statistics online database.

[3] **Javier, Emil Q,** 'Corn Farming Systems Within the Context of the Philippine Agricultural Landscape' in "Modern Biotechnology and Agriculture: A History of the Commercialization of Biotech Maize in the Philippines", various authors, by STRIVE Foundation, Copyright 2009, page 70 of 258 pages.

[4] **Ibid.** p. 74

[5] **Ibid.**, pp. 83-84

[6] **Ibid.** p. 73

[7] Key Informant Interview (KII), **Mr. Milo de los Reyes**, Head of the Secretariat of the Philippine Corn Program, Department of Agriculture, March 16, 2012

[8] Industry Corn Development Roadmap 2011-2016, Department of Agriculture, Corn Sector

[9] KII, Dr. Artemio Salazar, Ph.D., Institute of Plant Breeding, University of the Philippines, Los Baños, March 30, 2012

[10] Focused group discussions with corn farmers in Visayas and Mindanao

[11] **Javier, Emil Q,** 2009, op.cit., p. 76 of 258 pages.

[12] The Bureau of Plant Industry (BPI) is the DA line bureau that monitors all GM corn areas in the country. The Bureau of Agricultural Statistics (BAS) lumps together GM corn areas with hybrid corn areas in its data monitoring. Data presented is an approximation noting for a 10 hectare discrepancy in BAS and BPI data in Negros Occidental in 2011 where BPI data monitored 10 hectares of GM corn area in the province but which did not appear in BAS monitoring.

[13] **James, C.** 2010, op.cit. p. 5

[14] KII, **Mr. Milo de los Reyes**, March 16, 2012

[15] **James, C.** 2010, op.cit. p. 148

[16] Various interviews, Department of Agriculture Regional Farm Units VI, X, XII March 9, 19, and 26, 2012; Value chain analysis from the Corn Industry Reports of DA-RFU X and XII

[17] DA-BPI, March 8, 2012, http//biotech.da.gov.ph/

[18] James, C., op.cit., p.154

[19] **Regulation of Genetically Modified Crops in the Philippines**, March 8, 2012. DA-BPI accessed at http//biotech.da.gov.ph/

[20] **Brookes, Graham and Barfoot, Peter.** "GM crops: global socio-economic and environmental impacts 1996-2009". April 2011, pages 17 of 173 pages. Accessed at www.pgeconomics.co.uk/pdf/2011globalimpactstudy.pdf. See also James, C., 2010.

III. GM corn: Benefitting TNC interests

GMOs and the entire life sciences industry are a huge TNC business. This is the reason for the aggressiveness of corporations, governments and traders despite global evidences of negative impacts on people's livelihood, environment and health.

Reaping profits

Three decades ago, it was projected that biotechnology could bring in profits ranging from US$65 billion to US$100 billion by the 2000s. The highest projection was for agricultural products, followed by pharmaceuticals.[1]

In the annual report by the International Service for the Acquisition of Agri-biotech Applications (ISAAA), the global market value of GM crops was about US$11.2 billion in 2010, from US$10.6 billion in 2009. This accounted for 22% of the US$51.8 billion global crop protection market in 2010 and 33% of the approximately US$34 billion commercial seed market. The same report noted that the GM crop market comprised US$5.4 billion for GM corn (equivalent to 48% of total), US$4.3 billion for GM soybean (38%), US$1.2 billion for GM cotton (11%), and US$0.3 billion for GM canola (3%).

Meanwhile, advanced industrialized countries led by the US comprised 80% of the GM crop market, equivalent to US$8.9 billion. The rest, US$2.3 billion (20%), was accounted for by the underdeveloped countries. Meanwhile, the global trade in seeds is worth some US$15.3 billion in 2009, led by the Netherlands, US and France.

Further, the market value of the global biotech crop market is based on the sale price of biotech seed plus any technology fees that apply. The accumulated global value for the 15-year period, since biotech crops were first commercialized in 1996, is estimated at US$73.5 billion. **(Table 16)**

By production and area, the US comprised approximately 50% of the total global GM crop area planted (cotton, soy and corn).[2]

In 2011, total area planted to GM crops reached 160 million hectares globally. The global area planted to

Table 16. Global Value of the Biotech Crop Market, 1996 to 2010

Year	Value (Millions of US$)
1996	93
1997	591
1998	1,560
1999	2,354
2000	2,429
2001	2,928
2002	3,470
2003	4,046
2004	5,090
2005	5,714
2006	6,670
2007	7,773
2008	9,045
2009	10,607
2010	11,219
Total	73,589

Source: Cropnosis, 2010, ISAAA 2010 Report

GMO crops has grown significantly over the years, comprising 47% of total planted area of the same crops in 2010 **(Table 17)**. The area planted to GM crops is expected to increase with the imminent commercialization of Golden Rice by 2013.

Countries that gained the most economically (over US$1 billion) during the 14 years of commercialization (1996 to 2009) were US (US$29.8 billion), Argentina (US$10.3 billion), China (US$9.3 billion), India (US$7.0 billion), Brazil (US$3.5 billion), Canada (US$2.6 billion), and others (US$2.1 billion) for a total of US$64.6 billion.

Meanwhile, the value of the harvested GMO grains from GMO seeds was estimated at approximately US$150 billion globally in 2010, and projected to increase by 10-15% annually.

Controlling seeds

The ultimate beneficiaries of this global market for GMOs are a handful of giant agrochemical TNCs, most of which are from the developed countries – the US, EU, and Japan. In 2008, at the height of the global food crisis, these TNCs managed to reap huge profits reaching more than a billion dollars. Among the top six major agrochemical TNCs in 2009, Monsanto raked in the highest returns. Monsanto also got the top spot in the seed and biotech market. **(Table 18).**

Table 17. Biotech Crop Area as Percent of Global Area of Principal Crops, 2010 (Million Hectares)

Crop	Global Area*	Biotech Crop Area	Biotech Area as % of Global Area
Soybean	90	73.3	81
Cotton	33	21	64
Maize	158	46	29
Canola	31	7	23
Others	--	0.7	--
Total	312	148	47

Source: Compiled by ISAAA, 2010. *Latest FAO 2007 hectarage

Table 18. Largest Seed, Biotech and Agrochemical Corporations, 2009

Company	Biotech Seed Sales (M US$)	Rank (% market share)	Agrochemical sales	Rank (% market share)
Monsanto	7,297	1 (27%)	4,427	4 (10%)
Du Pont	4,641	1 (17%)	2,403	6 (5%)
Syngenta	2,564	3 (9%)	8,491	1 (19%)
Bayer	700	7 (3%)	7,544	2 (17%)
Dow	635	8 (2%)	3,902	5 (9%)
BASF	-	-	5,007	3 (11%)
Big 6 total	15,837	58%	31,744	71%

Source: Who Will Control the Green Economy, ETC Communique No. 107, Nov 2011

Agrochemical TNCs are able to control the rights over the seeds through patents. Laws have been created to support TNC control over seeds. Global example of these enabling laws is International Union for the Protection of New Varieties of Plants, which provides full patent protection for the transgenic seeds commercialized in the beginning of 1990s.[3]

Patents prohibit farmers to save seeds, and violators are penalized or even imprisoned in some cases. In the last 13 years from 1997 to 2010 for instance, Monsanto filed 144 lawsuits against American family farmers, with an additional 700 cases being settled out of court. In 2007, Monsanto collected US$21 million damages from small farmers and small farm businesses and US$240,000 from the 10 cases it filed against Canadian farmers.[4 5]

GM corn product information featuring guide in planting GM corn *(Left photo)*, precaution and terms and conditions in purchasing the product *(Right photo)*.

GM corn patents are being protected by the Plant Variety Protection Law which prevents the use/ reuse of the GM corn and its parental lines. The product info also states that the farmers should practice the Insect Resistance Management. This means that farmers should allot a buffer zone of non-GM corn as 'refugia' to prevent corn borer resistance to Bt corn. However, these procedures are not known to farmers, and if they do, they opt not to do it as it decreases the area allotted for GM corn and hence potential corn harvest.

Developed countries led by the EU and the US are pushing countries like the Philippines to adopt and implement patent laws similar to theirs to be able to maximize their gains for ensuring TNC profit and control.

Dominating the seeds market are Monsanto, DuPont and Syngenta. They increasingly forge networks among themselves and other smaller agrochemical corporations through agreements to cross-license transgenic seed traits. The commercialization of full patent-protected GM seeds of corn which later on expanded to other commodity seeds - such as soybeans and cotton, contributed much to greater consolidation of TNCs.

Agrochemical TNCs also extended their patents protection over non-transgenic seeds. They have filed claims on traits identified through genomic sequencing (marker assisted breeding), which has encouraged consolidation among non-commodity focused seed companies, such as those specializing in fruits and vegetables. Eventually, the TNCs have acquired or created joint ventures with more than two hundred firms across the globe.[7]

To date, the top four pesticide firms currently control 59% of the global market, and the top four seed firms control 56% of the global proprietary rights (copyrights, e.g., brand-name) seed market.[8]

Controlling food and agriculture

Consolidation among the world's largest TNCs in the agrochemical and pharmaceutical industries has provided leverage over a few TNCs to monopolize and control the global agriculture and food chain. Monsanto leads these TNCs as it is now the world's largest seed company mainly because of its patented transgenic seed technologies and acquisitions of biotechnology companies.

For instance, the major seed company Cargill sold its international seed division to Monsanto and its North American seed division to AgrEvo (later acquired by Bayer) in 1998. Cargill and Monsanto then formed a US$50 million joint venture called Renessen, which allowed Cargill to obtain access to Monsanto's transgenic seeds and other inputs indirectly through

the downstream grain collection and processing aspects of food and animal feed production. The alliance is one of several emerging "food chain clusters" that increasingly control markets from the gene and seed to the supermarket shelf.[9]

Companies of pharmaceutical and agrochemical companies also took place to take advantage of potential collaboration in what is described as "life sciences" industry, which is marked with numerous mergers. Monsanto, for example, merged with Pharmacia and Upjohn before a new Monsanto division focusing on agriculture was completely spun off. Syngenta resulted from a merger of the agribusiness divisions of Novartis and Zeneca, but AstraZeneca, which focuses on pharmaceuticals, remains a separate company. Bayer acquired the agribusiness operations of Aventis (itself of merger of Hoechst, Schering and Rhone Poulenc), but Sanofi-Aventis is a financially distinct pharmaceutical company. By 2009, six companies with chemical and/or pharmaceutical company roots remained dominant in the seed industry.

Another strategy by which TNCs control agriculture and the food chain and maximize profits is through cross-licensing where TNCs agree on cooperative agreements. Cross-licensing agreements have increased because of stacking multiple transgenic traits within a single seed (stacked varieties). Monsanto and Dow (the latter has agreements with every firm except Bayer) for example jointly undertook efforts in 2010 to commercialize a corn seed that has eight different transgenic traits (combinations of three traits are already in widespread use). [11]

Suppressing information?

There are already a plethora of studies on the effects of GMOs on the environment and human health, but there is also a systemic effort especially from agrochemical TNCs to downplay or even suppress findings. Meanwhile, host governments such as the Philippines, despite independent studies showing the possible negative effects of GMOs, are going on with propagation and commercialization, practically ignoring the precautionary principle. Even the fact that Filipino farmers for instance are not informed on the impacts that the GM seeds may bring violates the principle of free, prior and informed consent.

GMO proponents especially TNCs have devoted limited time for clinical tests of GMOs. Monsanto for instance has not followed the standards for pesticides and drugs safety testing, which is at least three months and on three mammalian species. The tests done on MON 863 for example have been done for only one mammalian species. The same procedure was employed in the testing for MON810, which is the first GM corn propagated in the Philippines. Independent studies recommend the application of the standard period of testing on three mammalian species over at least three weeks and employing larger sample sizes over one to two years before commercialization especially on GM corn.

On the other hand, peer-reviewed studies by scientists on GMOs primarily developed by Monsanto – GM soybean, GM potato, GM corn – the most widely commercialized GM crops globally have been found to have negative impact on the health of animals. The Bt toxin used in Bt corn for example has been found to affect the lower part of the small intestines of mice, which means that it survives digestion. Also, the amino structure of the Bt toxin has a section that is identical to a known allergen. It fails the allergy tests recommended by the WHO. [12]

Another study revealed that Bt-toxin is found circulating in the blood of North American adults and new-borns. Doctors at Sherbrooke University Hospital in Quebec found it in the blood of pregnant women and their babies as well as in non-pregnant women. The study postulates that it was consumed in the normal diet of Canadians, including from eating meat from animals fed with Bt corn, as most livestock are.[13]

Pest infestation on GM crops are also underreported or suppressed. There are reports that the rootworm beetle has infested Bt corn farms in the US especially corn farmers who have abandoned crop rotation either because they are cashing in on the high prices of corn or they have quotas to meet with bio-ethanol plants. Farms infested with the rootworm beetle have been increasing.[14]

What an increasingly concerned public is calling for is for clinical studies on health impacts be prolonged and that tests be made compulsory and obligatory for all GMOs commercially cultivated. Results of studies should also be made public. These procedures apparently have not been required for all GMOs released in commercial scale across the globe. Despite existing international protocols on biodiversity, IPRs, biotechnology, etc. and the emergence of new issues in corporate agriculture, advanced industrialized countries led by the US and the EU have not complied. All these only prove the thesis right at the beginning

of this study – that GMOs are actually about increasing corporate profits.

Influencing governments

Aside from investing billions of dollars in research and technology that would produce profitable technologies for them, TNCs also pour in billions of dollars to gain institutional support. They establish lobby groups to participate in international and local campaigns that would incorporate their products and technologies as part of the "solutions" to poverty and hunger.

Monsanto has also been known to sponsor journalists, legislators or policy makers, and farmers to visit their headquarters in St. Louis, Missouri in an attempt to convince them of the 'benefits' of GMOs. So-called farmers' federations heralding the positive impacts of GMOs are suspected to have been organized by GM proponents and are not truly representative of the majority of corn farmers, which are small-scale and indigenous.

In the US for example the 50 largest agricultural and food patent-holding companies and two of the largest biotechnology and agrochemical trade associations have spent more than US$572 million in campaign contributions and lobbying expenditures since 1999. These companies and trade associations hire well-connected lobbying groups, including at least 13 former members of US Congress and over 300 former congressional and White House staff, to promote genetically modified food and agricultural products.[15]

Lobbyists for agrochemical TNCs in the US also worked to prevent consumer labelling of GM foods, promote genetically modified livestock and animals, and prevent foreign governments from banning or limiting genetically modified crops and foods. In 2004, for instance, the lobby group BIO spent money on a bill that sought to promote biotechnology *outside* the US and a House resolution that sought to use the World Trade Organization (WTO) to force the EU to accept US biotech crops.[16]

The main corporate advocacy is to skirt biosafety responsibilities. In the Philippines, for instance, seeds and agrochemical TNCs led by Monsanto are into the advocacy against empowering government agencies and the affected communities in the monitoring and implementation of the biosafety guidelines and ensuring balanced information on the GMOs being field tested in their area. This is one of the reasons for the guidelines being not yet finalized after six years of being drafted. Seeds and agrochemical TNCs largely based in the US have much to lose should countries strictly enforce their biosafety guidelines.

TNCs are now looking at profitable prospects of propagating GM rice. Rice is grown in 251 million farms in over 156.7 million hectares. It is consumed by 3 billion people based largely in Asia where more than 90% of global rice is produced and consumed. Also, the top three US-based TNCs – Cargill, Archer Daniels Midland and Bunge – are actively lobbying for the complete liberalization of rice trade under the WTO. Should this happen, rice traded in the world market would expand from 7 to 15 percent.

Alienating the farmers

The long-term implication of seed manipulation through biotechnology is the alienation of the food producers from the seed. Through biotechnology, seeds have been developed increasingly towards satisfying the thirst for more profits of agrochemical TNCs rather than food security.

Then, seeds have been developed to promote unsustainable agricultural farm practices such as increasing amounts of inorganic farm chemicals used that deplete soil nutrients, poison ecosystems, destroy biodiversity, and lead to soil erosion. Now, GM seeds are packaged with herbicides and require volumes of fertilizers to attain the desired yields.

As TNCs profit from their monopoly over seeds, they also profit from the package of technologies that come along with the seeds. In 2009, the global crop protection market amounted to US$50.8 billion. Sales from pesticide protected plants or PPPs reached US$10.6 billion. Herbicides which are packaged with PPPs were worth US$17.9 billion.

All these led to reduced choices and decision-making by farmers. Around 15 million smallholder farmers from underdeveloped countries, who make up 90% of farmers in the world who planted GM crops in 2011, are now unable to save seeds and replant. Costs for producing food crops have increased over the decades with the introduction of GM seeds while farmers' incomes have decreased. Planting GM crops has also encouraged monocropping and veered farmers away from diversifying their crops.

Endnotes

[1] UNCTAD, 1988 **op.cit**, page 17.

[2] The USDA Economic Research Service reports that 80-90% of all corn, soy, and cotton grown in the United States is GMO. See **James, Clive.** 2010. Global Status of Commercialized Biotech/GM Crops: 2010. *ISAAA Brief* No. 42. Published by The International Service for the Acquisition of Agri-biotech Applications (ISAAA), copyright 2010, page 222 of 279 pages. Accessed at http://www.isaaa.org/resources/publications/briefs/42/download/isaaa-brief-42-2010.pdf

[3] **Howard, Philip H.** 'Visualizing Consolidation in the Global Seed Industry: 1996–2008', in "Sustainability 2009". 1, 1266-1287; doi:10.3390/su1041266. Accessed at www.mdpi.com/journal/sustainability

[4] **Barrett, Mike.** "Judge Throws Out Organic Farmers' Recent Case Against Monsanto". Accessed at http://naturalsociety.com/judge-throws-out-organic-farmers-recent-case-against-monsanto/

[5] **Andrews, Kurtis and De Beer, Jeremy.** "Accounting of Profits to Remedy Biotechnology Patent Infringement". Published 2010, Osgoode Hall Law Journal. Page 639, accessed at http://ohlj.ca/english/documents/47-4_DeBeer-FINAL.pdf

[6] **Howard, P. H.**, 2009, loc. cit.

[7] **Ibid.**

[8] A rough guideline developed by economists is that when four firms control 40% of a market, it is no longer competitive, **Ibid.**

[9] **Ibid.**

[10] **Ibid.**

[11] **Ibid.**

[12] **Quijano, Romeo F., M.D.** "Health Risks of Genetically Modified Food". Powerpoint presentation.

[13] **Ibid.**

[14] **Thornhill, Ted.** The billion-dollar pest: U.S. beetle is developing resistance to one of the most widely used genetically modified crops, say scientists

[15] "Food and Agriculture Biotechnology Industry Spends More Than Half a Billion Dollars to Influence Congress". *Issue Brief*, November 2010, accessed at www.foodandwaterwatch.org

[16] **Ibid.**

IV. Evidence from the Ground

This study aims to assess the socio-economic impact of GM corn, including health, environmental and food security concerns and looking into the various actors such as the TNCs, landlords, traders, local government, and scientists.

The case areas

The study was conducted from February to March 2012. Impact research was done in 12 barangays in seven GM corn producing provinces in Luzon (4), Visayas (4) and Mindanao (4). **(see Appendix 1)**

Isabela, Pangasinan, Bukidnon, Sultan Kudarat, and South Cotabato belong to the top 10 corn producing provinces in the country with Isabela comprising 34% of the total hectarage of GM corn areas in the Philippines.

Methods

The research was a combination of desk research and field research. Focused group discussion (FGD) and key informant interview (KII) methods were utilized in the field research. For the FGDs, corn farmers who experienced planting GM corn in the last 10 years were selected to provide their first-hand experience in planting GM corn. Barangay officials who are also GM corn farmers also participated in a number of the FGDs conducted. KIIs were also conducted for peasant leaders, barangay officials, local government unit (LGU) officials, municipal agriculturists, and regional officials

Interview with DAGAMI peasant leader Diony Yadao as he relates how the life and livelihood of Isabela changed in the introduction of GM corn in their farms.

Table 19. Economic Profile of the Research Communities

Case Areas and No. of FGD Participants	Household / population	Major sources of livelihood	Average farm size and ownership of land (hectares)	Production technology	Irrigation/other agricultural services
Villa Rey, Echague, Isabela (24)	412 population	78.41% engaged in farming; employed work is 18.18%; corn is the primary crop, palay is secondary crop. Vegetables, poultry	1 ha to 4 has; small-holder farmers; no titles to land – forestland	3 hand tractors; 7 threshers; multi-purpose drying pavement	Rainfed
Caquilingan, Cordon, Isabela (18)	~1,000 HHs	60% of families engaged in farming; 40% are seasonal workers; 30% farm laborers.	1 to 2 ha; land under contest	Farm animals, thresher, tractors	Rainfed
Banaban, Bayambang, Pangasinan (12)	1,634 population	Farming is primary source of income. Corn and palay are primary crops. Mungbean and other tubers are also planted.	Only 5-10% own lands. 90% farmworkers of which, 50% are either tenants or leaseholders. Land rent is 12-20 cavans per palay cropping. In some cases, tenants pay as rent 5 sacks of palay and 20% of their total profit from planting corn.	Farm animals, thresher, tractors	Rainfed; shallow tube wells
Macayo-cayo, Bayambang, Pangasinan (13)		Farming is primary source of income. Corn and palay are primary crops; mungbeans, tomatoes, bittermelon and eggplant. Almost all households have their own backyard livestock and poultry. Rope making is secondary livelihood where 70% of HHs are involved.	½ ha as most of the lands have been distributed and sub-divided among family members through P.D. 27; 70% of farmers own their lands, 30% farmworkers	10 hand tractors and two 'baby' tractors; each HH has its own plow.	Rainfed; shallow tube wells
San Nicolas, San Dionisio, Iloilo (9)	138 HHs	90% are farmers. Corn is primary crop and rice is secondary crop. Vegetables are also planted.	10% are farm workers and the rest are small-holder farmers. About 10% of the small-holder farmers lease their lands. The average size of farms is one to 1.5 ha; 300 square meters is the smallest while the biggest is two hectares.	30% of the farmers own carabao and plow and only eight own cows. Only one farmer owns a thresher. All farmers have native chickens, 90% have ducks, 40% maintains backyard swine, while 30% have goats.	Rainfed
Quinabonglan, Maayon, Capiz	188 HHs	Farming is primary livelihood. In Sitio Mabonoligon Proper, 90% are farmers. Small-scale mining / gold panning is secondary livelihood	1 to 3 ha with the majority owning 3 has – titled and with CLOA. The rest are tenants (7:1 sharing in favor of the tenant; or Php1,500-2,000 per crop, per hectare); farm workers make up 5% of the farming community	20 with corn thresher at Bgy level; 7 in Sitio Proper; rice thresher is 15 at Bgy level while 6 at Sitio Proper. Most families have their own carabaos but have sold them in exchange of motorcycles for transportation	Rainfed
Carataya, Cuartero, Capiz (17)	1,313 population ; 315 HHs; In Carataya Proper, there are at least 25 HHs	About 8,000 hectares. Farming is main source of livelihood. All farmers plant corn mostly in the uplands/ hilly portions which comprises 50% of Carataya's land area, palay is 20% of the land area. Forest lands comprise about 10% while the rest, 20% comprise the homelots and vacant cogonal areas.	Most farmers own a hectare of land. 30% of the farmers own their farmlands while the majority, 70% are tenants. Farmworkers comprise 15% of the total farmer population.	Hand tractor – 11; Corn sheller – 7; Rice thresher – 8	Rainfed

Table 19. Economic Profile of the Research Communities

Case Areas and No. of FGD Participants	Household / population	Major sources of livelihood	Average farm size and ownership of land (hectares)	Production technology	Irrigation/other agricultural services
Bungsuan, Dumarao, Capiz (15)	4,282 population 856 HHs	80% to 95% are into farming; corn and rice are primary crops	1/8 ha to 1 ha in the animal stock farm area; 3 ha in Bungsuan	All farmers have their own carabao but only seldom utilize them because of the propagation of the stacked variety of GM Corn	Rainfed
Halapitan, San Fernando, Bukidnon (14)	8,295 – population; 1,708 HHs	Farming is primary source of income for 85% of the population. 80% are corn farmers.	1 ha, 90% are small-holder farmers; some lease their lands; <10% are tenants. (as per bgy profile), average land holding per family is 4.25 hectares.	90% own carabao; 4 tractors, 10 baby tractors; 15 corn shellers; 10 shellers	Rainfed
Mindagat, Malitbog, Bukidnon (16)	2,192 population, 408 HHs	Farming is the primary source of income. Corn, rice and banana are primary crops.	1 ha to 3 has	4 threshers, 6 solar dryers, 1 corn sheller, 1 rice and corn mill; sickle 720, bolo knife 419, *purok* (bolo knife used for cutting grass) 420	Mostly rainfed with about 11 has. irrigated through farmers' initiative; seed subsidies. An agricultural technologists visit the area twice a week while the veterenarian / livestock technician visits only as needed.
Cinco, Banga, South Cotabato (8)	5,782 (2007) population, 1,249 HHs	Farming is primary source of income, 70% are farmers. Considered as corn capital of the Philippines and turnip capital of South Cotabato	1 to 2 ha; 10% own lands; 20% are tenants; 70% farmworkers.	One tractor; about 60% has baby tractor (kuliglig); 70% own carabaos – mostly the farmworkers.	Rainfed; some irrigated; NABCOR corn drying and milling facility
South Sepaka, Bagumbayan, Sultan Kudarat (formerly part of Sto Niño, South Cotabato) (12)	500 HHs	Farming is primary source of income, 100% are into farming.	1 to 2 ha, about 30% are small-holder farmers, 70% are under leaseholders re 15% of total harvest. 70% are farmworkers	Carabao instead of tractors are utilized. Tractor, 1; baby tractor, 2; thresher, 2; corn sheller, 1	Rainfed

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Table 20. GM Corn Areas Planted in Case Provinces, 2011 (hectares)

Rank	Island/Province	Bt	RR	Stacked	Pyramided	All
Luzon						
1	Isabela	5,395	994	231,027	538	237,954
3	Pangasinan	6,892	-	46,854	110	53,856
Visayas						
18	Capiz	-	301	6,511	436	7,248
12	Iloilo	-	499	10,484	486	11,469
Mindanao						
4	Bukidnon	1	3,632	36,087	-	39,720
9	South Cotabato	722	-	16,748	-	17,470
6	Sultan Kudarat	466	150	31,759	-	32,375

Source: Bureau of Plant Industry

***Padpad* or the manual removal of corn kernels from the cob is still being done in the province of Capiz.**

of the DA, including key national government offices and quasi-government agencies as well as private associations linked to the corn sector.

A total of 166 farmers participated in the FGDs in all case areas. There were 35 local government officials, including the regional offices of the DA, provincial and municipal agriculture offices and 16 national government officials and staff interviewed, including 17 peasant leaders, three seed growers, two representatives (local staff and national officer) of the government owned and controlled corporation National Agribusiness Corporation (NABCOR), and one from the private group Philippine Association of Feed Millers Incorporated (PAFMI). **(See Appendix 2)**

Majority of the farmer-participants are smallholder tenants and leaseholders. Except for farmer respondents from Echague and Cordon, all FGD participants are beneficiaries of the government's land reform programs under Presidential Decree No. 27 and the Comprehensive Agrarian Reform Program (CARP).

GM corn introduction

Before the farmers were introduced to the GM Corn varieties, they used to plant traditional white corn, improved open pollinated varieties and conventional hybrid corn.

The earliest time that farmers started planting GM corn was in 2003, as in the cases of Bgys. Carataya and Cinco. Farmers from Dumarao, and San Dionisio as well as in Cordon and Echague started planting GM corn only in the mid-2000s. In Bgy. Banaban, corn farmers shifted to GM corn only in 2009. The same is true for Bgy. Mindagat.

GM corn was introduced to the farmers through biotech sales agents of Monsanto, Syngenta and Pioneer, much like the same way they were introduced to the conventional hybrid varieties of corn. Agents usually come in right after harvest to introduce new seed varieties of the GM corn along with the chemicals packaged with the seeds.

Agents also visit traders and ask them to promote their corn brand. Farmers pointed out that the traders who also serve as their main financiers or lenders introduced and recommended to them which brand of GM corn they will plant. In the case of Macayo-cayo and South Sepaka, farmers said they were the ones who chose to plant the GM corn based on the stories they heard from nearby barangays and other corn farmers.

Based on interviews with the barangay officials, biotech sales agents would normally pay courtesy calls to them and ask for assistance in gathering the farmers for the routine consultation. In these consultations, agents would give out tokens such as towels and T-shirts bearing their company's name, raffle out gifts such as seeds and herbicides, and provide food for the attending farmers. In some cases, agents would go directly to the farmers.

Municipal Agriculture Officers (MAO) interviewed also affirmed this. According to them, biotech sales agents went to them at the beginning but later on went straight to the barangays. The MAO of Cuartero, Capiz does not concur with the current process. He says that, "there should be procedural process to create accountability on the impact of the GM corn and other GMOs that would be promoted later on" in his jurisdiction.

With the fast introduction of different GM corn in villages and communities, knowledge about the corn varieties being planted is also lacking or incomplete. The MAO in Maayon, Capiz said she is not aware of any GM corn being planted in Maayon, claiming that Bt corn had been banned in Maayon. She said that what are being planted are hybrid varieties. Barangay officials of Quinabonglan, Maayon however are aware of GM corn propagation in their area.

Corn brand naming is also a very important marketing strategy by the companies. When the farmers were asked if they were aware that what they were planting was GM corn or if they even know what GMO means, majority of the farmers said that they were only told it was hybrid corn. They only knew that Bt corn was the one they should avoid, which they knew were widely protested in the early 2000s. Corn seed sacks were not labeled Bt corn or GM corn, but only states that it is hybrid corn with corn borer protection, resistant to a specific herbicide or both.

For example, when agents introduced Roundup Ready (RR) corn, farmers were only informed of the presumed reduction of cost, particularly labor and days of waiting from weeding out the farms to planting.

Apparently, information about the possible effects on health of GM corn is also lacking. Asked if the agents told them that the GM corn should not be eaten and elaborated on its possible side effects, the farmers had mixed responses. In Echague, only the agent from Syngenta informed the farmers that the GM corn should not be eaten as they may experience stomach pains and diarrhea.

Table 21. Timeline of GM Corn Introduction to farmers in the case areas

Case Areas	Varieties Planted Before GM corn	Introduction of GM corn and Varieties Adopted
Villa Rey, Echague, Isabela	Until the 1980s, the place was still thickly forested and farmers practiced slash and burn (kaingin), clearing lands for settlement and farming. They planted rice, banana, cassava, and traditional white corn. In the 1990s, hybrid corn was introduced, such as San Miguel Corporation (SMC) corn varieties, Ayala Seed, Cornworld, Cargill, and Pioneer. Vegetables such as squash, tomatoes, bittermelon, peanuts and watermelon were also planted.	In the mid-2000s, farmers started planting Bt and Round-up Ready Corn. During this period, there were only a few vegetables, banana and some rice fields cultivated alongside corn production.
Caquilingan, Cordon, Isabela	From the 1980s until 2004, hybrid yellow corn planted were SMC, Cargill, Dekalb 818 (conventional), Cornworld, GSI – ordinary yellow and Bioseed.	From 2004 up to present, farmers plant GM corn varieties such as Dekalb 818 RRC2, Bioseed and other Dekalb GM varieties. Dekalb 9132 according to farmers is the most expensive GM corn brand.
Banaban, Bayambang, Pangasinan	Farmers used to plant traditional white and red corn in the 1970s. The open-pollinated-variety *Silangan* yellow corn was planted from 1980 onwards. Hybrid yellow corn was introduced in the 1990s by San Miguel Corporation and Cargill.	Dekalb 818 YG of Monsanto was introduced by traders in 2004.
Macayo-cayo, Bayambang, Pangasinan	Majority of farmers used to plant white corn from 1960s to 1980s such as *macapuno* and *haba-haba*. In the 1980s, *silangan* red corn was also introduced.	GM corn was introduced in 2002. Now, farmers also plant Pioneer 30T80 (stacked-trait), 30Y80 and Dekalb 818 YG.
San Nicolas, San Dionisio, Iloilo	Before 1978, farmers planted traditional rice (*Tres Marias, Lubang, Cotsiam*) and corn varieties with vegetables. The river and rice farms were also abundant with fish. Corn varieties such as SMC HYV yellow corn, Pioneer 888, and Cargill were introduced in 1984.	Bt Corn Yieldguard variety was banned in Iloilo in 2005. However in 2006, Pioneer introduced hybrid corn with "Todo Proteksyon" logo without the Bt corn label, thus evading policy banning Bt corn. GM corn propagation in Brgy San Nicolas started in 2006. They plant stacked varieties of GM corn specifically Pioneer 3482YR (stacked trait), Dekalb 9132, Dekalb 818 YG and RRC2.
Quinabonglan, Maayon, Capiz	In the 1980s, farmers plant native rice (*makan, tabukanon, malido*) and HYVs for own consumption. In 1983, SMC HYV yellow corn was introduced and later on replaced by Pioneer hybrid corn. In 2000, Monsanto's Dekalb 818 was introduced.	GM corn varieties introduced are Pioneer corn brands such as YR varieties (stacked-trait), 30G80, 30T80 and 30Y80. They also plant Monsanto corn varieties such as Dekalb 818 RRC2, 9132 and 878. Bioseed Healer 101 (stacked trait) corn varieties were planted in the uplands.
Carataya, Cuartero, Capiz	Rice production used to be the primary crop. Farmers used to plant traditional corn varieties such as *Surati, Tinigib, Singapore, Blanket*, up until 1990s. Farmers say that these corn varieties do not need application of fertilizers.	Farmers were introduced to hybrid corn production only in 2000 when Quedancor offered the farmers loans at 2.5% to 3% interest. Later in 2002, technicians from seeds corporations Monsanto, Pioneer introduced the GM corn varieties. The farmers said that they were only told that the new corn varieties were certified hybrid seed variety and not genetically modified.
Bungsuan, Dumarao, Capiz	Before 1980s, farmers planted only native corn varieties such as *Surati, Rapunza, Santitik, Tinigib, Cebu, UPCAVar* and *Miracle*.	In 2003, farmers started planting Dekalb 818 YG. In 2005, they started planting Dekalb 9132.
Halapitan, San Fernando, Bukidnon	Farmers planted native corn varieties such as *Red Horse* (so-called because corn kernels are yellow and red).	Farmers now plant Dekalb 818 RRC2, Dekalb 878 and Pioneer corn variety 3645R. They also plant Bioseed corn variety Healer 101.
Mindagat, Malitbog, Bukidnon	Before 1990s, farmers planted native corn varieties such as *Tiniguib* and *Casida*. In 1990, conventional hybrid corn varieties such as SMC and Cargill were introduced. In 1995, farmers started planting Pioneer 3014.	In 2004, Bt Corn was introduced by Monsanto through demo farms. Farmers also plant DeKalb 878 and Bioseed corn variety Healer 101.
Cinco, Banga, South Cotabato	From 1980s to present, farmers planted white corn (*Tiniguib, Pilit, Cebu*), yellow corn from the Lumads (*Carribean*), Ayala seeds and SMC. In the 1990s to early 2000s farmers were introduced to Cargill hybrid seeds and Pioneer 3014.	In 2002 to 2010, farmers were introduced to Pioneer 30Y80. However, farmers did not know it was Bt Corn because of the new brand name. In 2010, they started planting RR corn varieties. At present, they plant GM corn varieties such as Dekalb 878, Healer 101, Dekalb 818 RRC2, Evogene and Pioneer 30Y18.
South Sepaka, Bagumbayan, Sultan Kudarat	In the 1960s, farmers planted native white corn such as *tiniguib* and open pollinated varieties. In the 1980s under Kilusan Kabuhayan at Kaunlaran (KKK) livelihood program of then Pres. Marcos, hybrid corn varieties were introduced. Farmers also planted Pioneer 3014, Cargill and Dekalb 818.	In 2004, Bt Corn was introduced to the farmers. In 2006, farmers started planting GM corn varieties such as Dekalb 818 RRC2, Dekalb 878, Bioseed – Healer 101 and Evogene. They also plant sweet corn and other native corn varieties.

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In Cordon, the farmers were told they could eat RR corn, which they did. In both barangays in Bayambang, the farmers claimed they were never warned not to eat the GM corn. Still some try to eat GM corn, especially farmers in Bgy. Macayo-cayo. They claimed they experience gas pains every time they eat GM corn and hence consume only one to two cobs, unlike with white corn which they consume and eat as much as they want. In the case areas in the Visayas, farmers claimed they were never told nor warned about the GM corn. The same is true for farmers in the case areas in Mindanao.

Meanwhile, even the Regional Field Unit Officer in Region XII claims that the GM corn can be eaten. However, the MAO in Echague says, "understandably, any corporation promoting their products would not admit to any negative side effects of their products".

In a separate interview, National Corn Coordinator Milo de los Reyes also claims there are no known side effects to date from eating GM corn. In fact, Mr. Delos Reyes said that GM corn is used in corn chips and snacks such as Chippy, Cornik, Boy Bawang.

Demo farms also played a major role in the introduction of GMOs. According to the MAO of Bayambang, people from Monsanto, Pioneer and Syngenta approached his office in the early 2000s to introduce GM corn. Several farmers were invited by the MAO to attend the demonstration, after which, corporations contracted selected farmers whose corn farms were located along the road to serve as demonstration farms (demo farms). Signage were put up to advertise the corporation's name and the corn variety planted. Corn farms along the highway traversing Pangasinan are also showcased by the seeds corporations.

In the Visayas, demo farms were widely utilized by the seed companies. Corn harvest festivals are also held where prospective buyers, producers and traders are invited to inspect the corn variety. Demo farms are quite lucrative for farmers, as the corporations are the ones who would normally shoulder the expenses while the farmer gets to sell the harvest and keep the proceeds.

A corn farmer from San Dionisio whose 1.8 hectares corn farm sits by the roadside related that he has been planting corn under contract with seed companies Pioneer and Monsanto. The last time his farm was used as a demo farm by Monsanto was in December 2011. He recently harvested in February 2012 and many traders including Monsanto officials came to the corn

Promotional materials used by seed companies to convince farmers to plant GM corn

harvest festival held in his farm. All 42 corn varieties of Monsanto were planted to compare which has the best outcome. According to the corn farmer, he netted Php112,000 in his last harvest of eight tons which he was able to sell for Php14 per kilo. Researchers have asked for a copy of the contract agreement between himself and Monsanto, however he said that he was never provided a copy of the contract by Monsanto or Pioneer.

Other demo farms of Monsanto are located in the towns of Lemery and Batad, Iloilo.

Farmers in Maayon and Dumarao, Capiz also confirmed the demo farms by seed companies. Farmers in Cordon, Isabela claimed that there were also demo farms in Cauayan, which they claimed was the stronghold of Monsanto. There were also demo farms in South Cotabato and Sultan Kudarat.

Government officials interviewed said they only facilitated the consultations but did not take part in the promotion of GM corn or the set-up of demo farms. There were cases however when local government officials, including governors attend demonstration programs to show and convince them that GM corn can be eaten, as in the case of Governor Larry de Pedro, former governor of South Cotabato. GM corn seeds

Field demonstration (demos) of GM corn at Brgy Macayocayo, Bayambang, Pangasinan. Farmers are attracted to accommodate GM corn field demos as they are given free seeds and finance for the planting GM corn. To assure them of profit, the products of the field demo are bought by the promoter.

actually find their way to the farmers through seeds subsidy programs of the government. In Cuartero, the micro-credit institutions convince farmers to plant GM corn by providing them loans for capital.

Tracing the Value Chain

A. Seed supply

The seeds and agricultural inputs of these traders mostly come from agrochemical TNCs Monsanto, Syngenta, Pioneer and Cargill. Seeds are grown locally by seed growers contracted by seeds corporations or imported. In Pangasinan, AlDiz (Alvarez-Dizon) supplies seeds and other agricultural inputs to traders. AlDiz also supplies to agricultural traders in the Visayas and Mindanao.

The government also serves as supplier of GM corn to farmers through seed subsidies in times of calamities. Seed corporations bid against each other to win the contract of supplying the seeds to the government.

Farmers also get seeds from the local seed growers, who 'illegally' sell the seeds contracted by the companies. These seeds, called "ukay-ukay" are sold at a much cheaper price than the regular GM corn sold by traders. The ukay-ukay seeds however are untreated with chemicals and may be a mixture of seeds coming from different contract growing seed farms hence the name.

Seed growers

There are farmers contracted to grow seeds in Mindanao. Three were interviewed in Banga, South Cotabato. According to the corn farmers, Monsanto and Pioneer provide the financing from land preparation to harvesting. The farmers provide the land. However, seed growers are not provided with a copy of the contract they have signed.

Seed companies provide all the inputs including the farm workers and the supervisor to oversee the whole process of planting to harvesting. At Banga, Pioneer and Evogene are the seeds companies that contract the farmers. Pioneer Hi-Breed set up office in Bgy. 5 in 2007 until 2009. Prior to this, they had seed growers from 2002 to 2007 in Polomolok, South Cotabato.

The terms of the contract however are not the same. In Bgy. 6 in Banga, seed growers contracted out by Pioneer Hi-Breed are assured of Php9,000 income even if the harvest is not the desired quota of eight tons per hectare. Evogene does not require a quota for seed growers. Seeds corporations according to a barangay official in Banga, apply for permit to contract seed growing from the Municipal Office. The barangay captain issues certification for seed growers of GM corn.

Imported Seeds

Most of GM corn seeds imports come from Argentina and South Africa, with the US a distant third. Other sources of GM corn seeds are Brazil, India, and Thailand. For GM soybeans, the US is the number one supplier **(Table 22).** On the other hand, the country exported GM corn seeds only once in 2006 at a minimal 71.21 kilograms to Colombia.

B. Corn traders

Seeds and farm inputs such as fertilizers and pesticides are sourced from the local suppliers or traders. Because of expensive capitalization in GM corn farming, most

Table 22. Volume of Importation of GM Seeds by GM Crop and Country of Origin, 2007-2012 (metric tons)

Commodity and Country	2007	2008	2009	2010	2011	As of Jan 2012	Total
GM Corn	**92.352**	**899.076**	**186,509.323**	**213.000**	**4,574.360**	**0.085**	**192,288.196**
Argentina	92.352	168.009	182,579.500	-	1,932.077	-	184,771.938
Brazil	-	-	0.018	-	0.061	-	0.079
USA	-	0.014	0.017	-	42.379	0.085	42.495
South Africa	-	731.053	3,929.788	213.000	2,595.578	-	7,469.419
Thailand	-	-	-	-	1.020	-	1.020
India	-	-	-	-	3.245	-	3.245
GM Soybean	**-**	**1,978.000**	**4,238.000**	**625.000**	**6,235.748**	**-**	**13,076.748**
Canada	-	-	102.000	-	151.330	-	253.330
USA	-	1,978.000	4,091.000	625.000	5,169.714	-	11,863.714
China	-	-	45.000	-	-	-	45.000
Argentina	-	-	-	-	914.704	-	914.704

Source: Plant Quarantine Service, BPI

of the farmers borrow inputs or capital from the traders. Thus the traders also serve as the financiers for planting GM corn. Traders would also advise and recommend to the farmers which seed varieties would produce the best harvest.

Big traders are usually Filipino or Filipino-Chinese businessmen engaged in trading and transportation of agricultural products including animal feeds. They also venture in other businesses such as hardware, groceries, among others. Some are board members of national federations like the Philippine Maize Federation (PhilMaize).

There are also small traders operating at the barangay or municipal levels, or large traders engaging at the provincial to regional and inter-regional transactions.

Local politicians such as Mayors, Vice Mayors, Provincial or Municipal Councilors as well as Barangay Captains, or relatives of politicians or people in the government are also into trading. They may be incumbent or have served their terms in previous administrations but have maintained their influence in the profitable business of trading and financing. These government officials also own agricultural supplies stores. Some are also involved in buying and selling corn.

- For example in Bgy. Villa Rey in Echague, farmers said that the big financier-traders are the incumbent Municipal Councilor and the Mayor and Vice Mayor from the nearby municipality of San Guillermo. A big financier-trader in Echague is the brother of an incumbent Municipal Councilor. Likewise in Bayambang, two of their incumbent Provincial Councilors have linked up their businesses to finance and provide inputs to farmers. In Capiz and Iloilo, the LGU officials and their relatives are involved in corn trading and financing.

- In Maayon, the incumbent Bgy. Captain of Quinabonglan used to work for a big trader in Iloilo. His family finances corn farmers in Quinabonglan. In Iloilo, the wife of San Dionisio Mayor also finances corn production. In Bgy. Carataya, Cuartero, farmers said that the trader-financiers are the incumbent Mayor and a Provincial Councilor.

- In San Fernando, Bukidnon, farmers identified the incumbent Mayor and Bgy. Captains of Halapitan and Kagalangan as financier-traders. In Banga, South Cotabato, the incumbent Mayor and his relative, are among the financier-traders.

C. Production

Except for Macayo-cayo and Banaban, all the case areas plant the stacked trait GM corn (Bt and herbicide resistance). The production process for the case areas differs only in the order of application of the herbicide glyphosate.

If corn is planted in hilly farmlands, land preparation starts with the farmers spraying the herbicide over

their fields to kill weeds. In lowland corn farming, farmers spray the herbicide days after the corn seeds has been planted.

The process of corn production in the uplands are as follows:

1. GM corn production starts with spraying the field with Roundup herbicide or glyphosate. Corn farmers usually use Roundup, Clear-out, Shine, Sharpshooter brands.
2. After two weeks from herbicide spraying, the land is ploughed up using carabao to establish the seed rows. Fertilizer is applied simultaneously with the ploughing. After which, the seeds are planted in the seed rows or seed planting tools so-called "armalite" or "jabber".
3. Spraying of herbicide follows after two weeks.
4. Two weeks later, another round of fertilizers is applied (side-dress).
5. Again spraying of herbicide is done after 7 to 15 days.
6. A final application of fertilizers or top dress is done, especially when the soil is acidic, or has 'aged' in farmer's terms.
7. Harvesting is done after 120 days from planting.

Corn farmers in the case areas normally plant corn twice a year, with some planting a third crop if the weather for corn production is favorable. For farmers in Bayambang, they only plant corn once a year because they plant rice during the rainy season.

Corn is planted in June or July and in November or December. Harvest season is in the months of September or October and in January or February. For some farmers, the third cropping is in March or April and harvest is in June or July.

In Bayambang where rain is scarce, corn farmers irrigate four times during the cultivation period. Irrigation is done on the same day as the application of fertilizers.

Fertilizer application and spraying of herbicide is done depending on the condition of the corn farms. A good harvest for GM corn is also dependent on the amount of fertilizers applied. To get a good harvest, corn farmers would apply 10 to 12 bags of fertilizers per hectare, but because of increasing costs of fertilizers, only 6 to 8 bags of fertilizers are usually applied.

Some farmers would opt not to apply herbicides and instead feed the weeds to their farm animals. Farmers in Bgy. Macayo-cayo feed the weeds to their livestock and so use only Bt corn. In Bgy. Banaban, farmers also do not use the stacked variety. Although they spray herbicide to the GM corn, they only use the conventional weed killer rather than the glyphosate herbicide which is expensive.

Farmers observe that the GM corn only produces good harvest under good weather conditions during the first one to two croppings, but would later on require more bags of fertilizers to produce the same volume of harvest. But because of increasing costs of inputs, corn farmers apply fewer amounts of fertilizers and hence get almost the same volume of harvest if they use the conventional variety of hybrid corn. They plant GM corn with the assurance from companies that it would have greater resistance to the corn borer.

D. Who are the corn buyers?

Farmers sell their corn back to their financier-traders. During harvest, agents of these traders go to the farms and collect the harvest. From the traders, the corn is sold and delivered to the feed-millers and feeds suppliers.

The traders, because they are the farmers' financiers, are the ones who also set the buying price. Corn prices are relatively higher at the start of the harvest season, but as corn starts to pile up with the simultaneous harvests, corn prices decreases almost every day.

According to the farmers and LGU officials interviewed, corn from Isabela and Pangasinan is sold to millers in

Table 23. Key Players of the Local Feed Milling Industry, 2007

Name of Company	Brand name	Daily Production Capacity (in metric tons)
San Miguel Foods	B-Meg Feeds	3,229
Cargill Philippines	Purina Feeds	1,760
Swift Foods	Blue Ribbon Feeds	1,612
General Milling	General Feeds & Megamix	1,520
Vitarich Corporation	Vitarich, Vitalux & Bionic	1,387
Tyson Agro-ventures	Tyson Feeds	800
Sun Jin Philippines	Sun Jin Meals	760
Foremost Farms	Famous & Rich Feeds	720
Universal Robina	Star Feeds 555	598
Grain Handlers	Mighty Feeds	450

Source: Philippine Association of Feed Millers, Inc.

Sacks of corn coming from far-flung areas in Capiz will be weighed and sold to a corn trader.

Tarlac, Pampanga, Bulacan, Bataan, down to Batangas – to Robina Farms, B-Meg, and Selecta Feeds. Pioneer also buys corn from the traders. In Isabela, farmers say that the Mindanao Grains Processing Co. (MGPC) located in Reina Mercedes buys corn in cobs from the farmers, but only farmers who are not tied to the traders are able to sell.

In the Visayas, traders and feed millers are found in Iloilo, such as Purina, B-Meg, Lovefeeds, Midway, Vitarich, and Foremost. In 2011, 78% of corn produced in Region VI was utilized by local feedmillers while the rest was shipped to Manila, Batangas, Cebu, and Ilocos.

In Mindanao, traders sell the corn to B-Meg, Sulu Feeds, Limketkai, Bounty Fresh, Gamma Foods, Vitarich, Adahar, William Go, Eden Trucking, Ochoa, Vicky Tan, Mindanao Grains, PG Ang, and Purefoods. These feed millers are located in Cagayan de Oro, General Santos City, and Tacurong. Corn from Region XII is also shipped to Manila, Cebu, and Davao.

B-Meg, Purina and Vitarich are brand names of the feeds owned by San Miguel Foods, Cargill Philippines and Vitarich Corporation, respectively, which are members of the Philippine Association of Feed Millers, Inc or PAFMI.

PAFMI's 29 members represent about 80% of the entire feed milling industry composed of about 600 feed millers (365 of which are commercial feed millers). San Miguel Foods comprise 35% of the total feeds production of the PAFMI.

Mindanao Grain Processing Co. (MGPC) is part of the La Filipina Uy Gongco Corp. group of companies and is consistently among the top agribusiness corporations in the country. The largest corn processing plant in Southeast Asia, Reina Mercedes Corn Processing Center (RMCC) is co-financed and partly owned by MGPC together with the NFA. MGPC has two other corn processing centers in Bukidnon but the RMCC has five times the capacity of the Bukidnon plants.

According to the RFU Officer of the DA in Region 10, the traders also serve as informal contractors by getting sure supply for the feed millers that also own livestock and poultry farms such as San Miguel Corporations' B-MEG, Purina, Universal Robina, Vitarich, Lucio Tan's True Feeds, among others. San Miguel Corporation however has contract growing arrangements with corn farmers in Isabela and other provinces.

Government intervention in corn trading

Other than the financier-traders, farmers may also sell to the corn drying facility of NABCOR as well as the NFA. NABCOR buys the corn in cobs from the farmers, but these should have at least 30% moisture content. The drier the corn, the higher is the buying price. NABCOR is a government-owned and controlled corporation (GOCC) operating parallel to the thrust of the DA. It acts as the trading and marketing arm of the DA in the acquisition and distribution of farm outputs and inputs for the small farmers and fisherfolk. NABCOR also initiates "pioneering or missionary-type" projects to prime agribusiness investments in areas where private sector participation is not yet available due to risks.

Usually NABCOR is established in areas where there are corn clusters of at least 200 hectares. There are currently 14 NABCOR facilities across the country with a total capacity of 1,400 MT per day.

On the other hand, to be able to sell to the NFA, farmers are required to have a passbook. A passbook requires farmers to show proof of ownership to their corn farms, which most corn farmers do not have especially farmers whose lands are being contested. Likewise, for the NABCOR, the traders are the ones able to access its facilities rather than the small farmers. Farmers financially tied to traders also cannot sell directly to NABCOR. The volume of corn procured by NABCOR is also limited, thus farmers are forced to sell their produce to local corn traders.

GM Corn Impacts on Smallholder farmers

The smallholder farmers and the tenants in the case study areas experienced: 1) increasing indebtedness; 2) loss of ownership of their lands and control over their seeds; 3) food insecurity from loss of biodiversity including heavy soil erosion; and 4) threats to health.

Negative net income

In all the 12 case areas, farmers have incurred negative returns and most of them are indebted to their financier-traders. Based on the computation of their costs of production per hectare in the last cropping season, farmers who used their own cash as capital may earn Php520 to Php19,160 to being bankrupt by Php6,610 or more in one season of planting GM corn. For those who borrowed money from financier-traders, only a fraction of them earned while many ended up with negative income.

The farmers who earned however said that in reality nothing came back because almost all of their production needs including food were financed by the traders. According to one farmer in Bgy Banaban, "*Nakain mo na di mo pa naaani*" (You have already consumed what you have yet to harvest). There are some farmers who have family members working abroad that at times provide support. In such instances, the farmers could fetch higher prices for their corn because they were not indebted to the financiers-traders and not forced to sell at lower prices dictated by the traders. They were free to sell to any trader with the highest buying price for corn.

Table 24 shows the summary of farmers' net income assuming good harvests. The situation is worse in times of bad harvests. Net income is computed based on farmer's own capital for production (SELF FINANCED) and if the capital was loaned from financiers-traders (LOAN FINANCED). Computation of the cost of production per hectare in selected case areas is located at the appendix section **(Appendix 3, Tables 1 and 2).**

Apart from being indebted to the financier-traders, prices of inputs and seeds have also gone up. From 2003 to 2011, the price of Complete (14-14-14) and Urea, the most common fertilizers used by the corn farmers, increased annually by 13.7% and 10.6%, respectively. Prices peaked in 2008, reaching Php1,671.67 per bag of 14-14-14 and Php1,551.43 for Urea. In the same year, the national average price for 14-14-14 peaked in June 2008 at Php 1,671.67 per bag. **(Figure 4)**

Farmers in Capiz and Bukidnon said they stopped planting GM corn for a while in 2007 to 2008 when prices of fertilizers skyrocketed.

Also, the introductory price of GM corn was almost the same as the conventional hybrid corn in the early 2000s. Farmers said that the GM corn seeds were sold to them before at 18 to 20 kilos per bag. In Carataya, Cuartero for example, the Roundup ready GM corn then cost Php2,800 per 18-kilo bag. In 2008, it cost Php4,600 for every 9-kilo bag. Farmers had to spend Php9,200 for two bags of the RR GM corn for one hectare. **Table 25** presents a comparative price of conventional hybrid corn and GM corn in Region 10.

GM corn seeds bag then was packaged with the Roundup herbicide. Nowadays, farmers complain, the GM seeds and herbicide are sold separately and the Roundup is the most expensive brand that corn farmers are using. **(Table 26)**

Before, farmers also saved the seeds and hence saved on the cost of seeds. With GM corn, they can only plant the seeds once. They tried planting the seeds for another cropping but produced poor results. Farmers also complained that there are GM seeds that are not viable. This thus affects the overall yield of the farm. They also say that companies do not replace seeds that did not germinate.

The combined cost of GM corn seeds and herbicides eat up 22-26% of the farmers' total cost of production. Fertilizers on the other hand eat up around 18-22% of the total cost of producing GM corn **(Table 27)**. Thus, about 40-48% of the total costs by the farmer are external inputs, and these goes to the corn traders/ finaciers and seed and agrochemical companies.

Meanwhile, farm workers lose their livelihood as weeders since they are not needed in the corn farms anymore as farmers are now using Roundup ready variety of the GM corn. Likewise, bayanihan culture, which was previously widely practiced in the rural communities, is now seldom practiced with the adoption of GM corn.

Also, the traders and the feed millers dictate the prices of yellow corn. World prices of corn and its substitutes, wheat and soybeans, also influence the local prices of corn. Prices of yellow corn are pulled down every time imported corn comes in and during harvest season. Traders and feed millers may declare a "stop buying" operation, which further pulls down the prices of corn. This is one way by which traders and feed millers manipulate prices of corn and increase their profit margins. The farmers, while being the primary producers of yellow corn, have no participation in the price determination of their own produce.

Usurious rates of Traders

With GM corn now a commodity bought every season, traders and financiers took advantage of the situation. Traders charge farmers with 5-10% monthly interest on the farmers' loans. The inputs are also priced higher when bought on a loan basis. Depending on the product, price mark-up ranges from Php5 to as high as Php1,500 per product.

In the four months of GM corn cultivation, farmers would have to pay interest on their loans ranging from 20-40 percent. They are bound to sell their produce to the traders at a price usually lower than the prevailing market price. Farmers also lose more to the traders

Table 24a. Net Income of Self-financed Farmers Planting GM Corn

Case Areas	Average Yield (tons/ha)	Total Cost (Php)	Gross Income (Php)	Net Income SELF FINANCED (Php)
Villa Rey, Echague, Isabela	5.2 (3.5 – 5.2)	43,110	38,550 – 44,400	(4,260) – 8,480
Caquilingan, Cordon, Isabela	5 (1.6 – 7.7)	49,900 – 52,110	55,000	2,890 – 5,100
Banaban, Bayambang, Pangasinan	7.5 (4 – 7.5)	70,840	90,000	19,160
Macayo-cayo, Bayambang, Pangasinan	5.46 (4 – 5.46)	53,242 –62,667	65,520	2,853 – 12,278
San Nicolas, San Dionisio, Iloilo	3 (3.8 – 6)	43,610 – 45,350	37,500	(7,850) - (6,110)
Quinabonglan, Maayon, Capiz	3.55 (3.5 – 4.5)	42,941 – 48,761	42,600	(6,280) – (341)
Carataya, Cuartero, Capiz	4.8 (2.1 – 4.8)	48,530 – 50,970	60,000	9,030 – 11,470
Bungsuan, Dumarao, Capiz	5.32 (2.8 – 5.32)	57,349 – 61,549	63,840	2,291 – 6,341 **
Halapitan, San Fernando, Bukidnon	4.95 (4.2 – 5)	45,451- 46,531	59,400	12,869 – 13,949
Mindagat, Malitbog, Bukidnon	3.5 (3.5 – 4.5)	40,501 – 45,126	35,000	(10,126) – 6,299
Cinco, Banga, South Cotabato	7.29 (7 – 9.7)*	30,765 – 37,388	37,908	(1,455.60) – 7,143
South Sepaka, Bagumbayan, Sultan Kudarat (formerly part of Sto Niño, South Cotabato)	8.25 (8 – 8.25)*	33,000 – 34,300	41,250	6,950 – 8,250

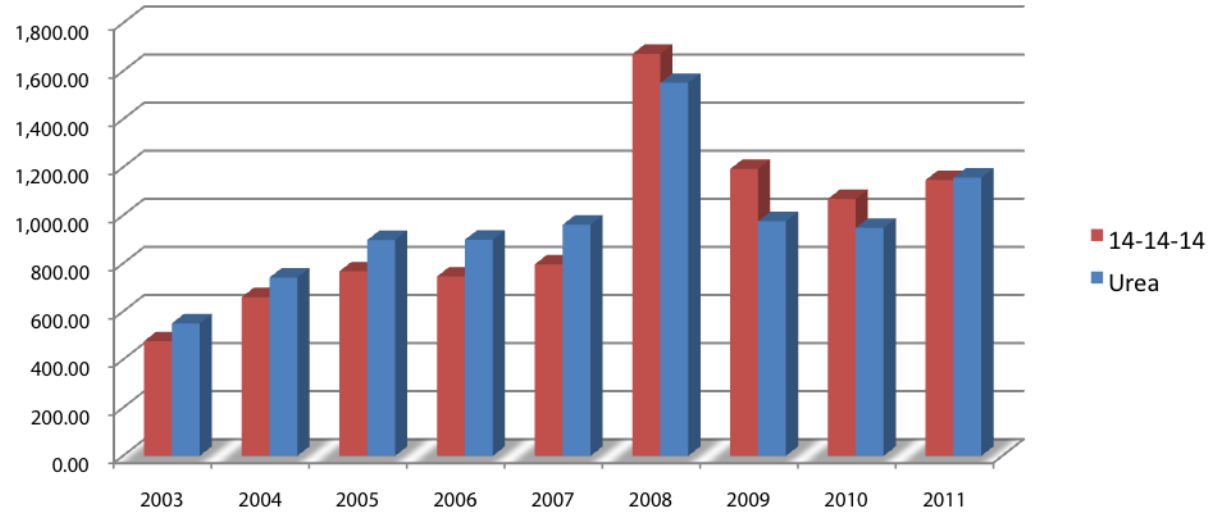
* weight in cobs
** If rice was loaned ex. 6 sacks x 1,500 to 2,000 per sack of rice, the farmer would be indebted by 2,000 to 4,000; up to 8,000 to 10,000 after four months
Numbers in parenthesis under Average Yield are range of yield depending on weather and fertilizer input
Figures enclosed in parenthesis under Net Income posted negative income

Table 24b. Net Income of Farmers Planting GM Corn, Loan Basis

Case Areas	Average Yield (tons/ha)	Total Cost (in pesos)	Gross Income (in pesos)	Net Income (in pesos) LOAN BASIS
Villa Rey, Echague, Isabela	5.2 (3.5 – 5.2)	58,420	38,850 – 44,000	(19,570) – (6,830)
Caquilingan, Cordon, Isabela	5 (1.6 – 7.7)	62,600 – 63,550	55,000	(9,150) – (7,000)
Banaban, Bayambang, Pangasinan	7.5 (4 – 7.5)	81,710	90,000	8,110 - 8,290
Macayo-cayo, Bayambang, Pangasinan	5.46 (4 – 5.46)	61,507 – 76,015	65,520	(10,495) – 4,013
San Nicolas, San Dionisio, Iloilo	3 (3.8 – 6)	51,757 – 53,845	37,500	(16,345) - (14,257)
Quinabonglan, Maayon, Capiz	3.55 (3.5 – 4.5)	53,388.64 – 64,892.52 Tenant: 58,181.06 – 66,872.58	42,600 Tenant: 36,900	(22,293) – (10,788.64) Tenant: (30,267.60) – (22,281.06)
Carataya, Cuartero, Capiz	4.8 (2.1 – 4.8)	57,716 – 60,644 Tenant: 98,988.60 – 101,112.60	60,000 Tenant: 12,000	(644) - 2,284 Tenant: (86,988.60) – (89,112.60)
Bungsuan, Dumarao, Capiz	5.32 (2.8 – 5.32)	62,253 – 71,093.50	63,840	(7,253.50) – 1,587 –**
Halapitan, San Fernando, Bukidnon	4.95 (4.2 – 5)	55,015 – 60,390	59,400	(990) – 4,385
Mindagat, Malitbog, Bukidnon	3.5 (3.5 – 4.5)	53,581 – 58,886	35,000	(23,886) – (6,781)
Cinco, Banga, South Cotabato	7.29 (7 – 9.7)*	37,973 – 43,488	37,908	(8,928) to (65)
Cotabato)	8.25 (8 – 8.25)*	37,208.80 – 40,304	41,250	946 – 3,529.20

* weight in cobs
** add to this the loan incurred by the farmers from borrowing an average of 6 cavans of rice, the corn farmer would be indebted by 9,813 to 18,653.50
Numbers in parenthesis under Average Yield are range of yield depending on weather and fertilizer input
Figures enclosed in parenthesis under Net Income posted negative income

Figure 4. Fertilizer Prices, 2023-2011



14-14-14	476.66	659.81	767.36	746.21	796.4	1,671.67	1,193.13	1,068.46	1,147.13
Urea	550.96	741.75	897.74	898.95	961.08	1,551.43	975.88	948.47	1,157.00

Source: Fertilizer and Pesticides Authority

Table 25. Price Comparison of Conventional Hybrid Corn with GM corn, 2011 and 2012 (SRP*)

Variety	Weight (kg)	2011	2012
Hybrid Corn			
ACM 800	18	2,700	2,700
Bioseed 828	18-20	3,900	4,200
Bioseed 9909	18-20	3,900	3,900
GSI 40	18	2,500	2,700
NK 8840	18-20	4,200	4,500
NK Jumbo (Syngenta)	18	4,000	4,500
Pioneer 30B80	18	4,600	4,850
Pioneer 30M50	18-20	3,900	4,200
Pioneer 30W40	18	3,600	3,780
GM Corn			
Bioseed Healer 101	9	4,000	4,900
Dekalb RR 818	9	4,000	4,700
Dekalb RR 878	9	4,200	4,900
Pioneer 30G80 (RR)	9	3,800	4,500
Pioneer 30YR	9	4,000	4,500
Pioneer 3645YR	9	4,000	4,500
Pioneer 3T80	9	4,000	4,500

Source: DA-RFU Region 10

Peasant leader Ben Cardenas shows an example of GM corn bag that the farmers purchase at local traders and agricultural supply stores. He noted that thru the years the GM corn seeds are getting more expensive, but on the other hand the seed quantity/weight per bag has been halved from 18 kilograms to 9 kilograms per bag.

Table 26. Price Range of Herbicides Commonly Used by Farmers (per gallon)

HERBICIDE	PRICE – RANGE (Php)
Power	1100, 1200
Round-Up	1400, 1500, 1600, 1800
Spitfire	1200
Shine	1100
Clear-Out	1200, 1400,
Sharpshooter	1100, 1480

Source: FGDs in Luzon, Visayas and Mindanao, February to March 2012

Some of the herbicides used in herbicide tolerant corn farms.

Table 27: Summary of Cost and Percent Share to Total, Cost of GM Corn Production if Self-Financed or thru Loan, Brgy Bungsuan, Dumarao, Capiz*

ITEM	Summary of cost	
	SELF FINANCED	LOAN
LABOR	20,030.00 (32.5)	20,030.00 (28.2)
FOOD	4,200.00 (6.8)	4,200.00 (5.9)
SEEDS	9,100.00 (14.8)	12,420.00 (17.5)
FERTILIZERS	11,240.00 (18.3)	15,849.00 (22.3)
HERBICIDES	4,500.00 (7.3)	6,115.50 (8.6)
RENT**	7,760.00 (12.6)	7,760.00 (10.9)
AUXILLARY***	4,719.00 (7.7)	4,719.00 (6.6)
TOTAL	61,549.00	71,093.50

*computed at maximum rate

**includes drying facility, draft animal and shelling

***includes transportation cost, sack and twine

Note: values in parenthesis are percent share to total.

See Appendix 4 for the computation of the cost of production

because traders would declare a lower weight for the farmers' corn by 3 to 5 kilos per cavan, a sort of 'system loss'. Assuming that farmers sell 100 cavans of dried corn kernels to the traders at a minimum Php10 per kilo, the farmers would lose an additional Php3,000 to Php5,000.

Financier-traders also charge the farmers in compounded interest rates if they fail to pay after harvest. Some however show some compassion, foregoing the compounding of interest and just leave the principal loan as is. Farmers lament that even though GM corn production has higher yield or heavier corn cobs, farmers still end up indebted to the financier-traders and their guarantors. Interest on loans including mark-up eats up about 26% of the farmers' total cost of production.

Aside from production expenses, farmers also borrow for their daily sustenance while waiting for harvest. Farmers would normally borrow cavans of rice from the same traders and pay up to Php2,500 per cavan of rice, which only costs Php1,100 to Php1,200 if bought in cash. For instance, during the lean months of August and September, truckloads of cavans of rice come from the central city, which the farmers borrow from traders. Other than rice, farmers also borrow for education expenses, hospitalization, and electricity, among others. Farmers also borrow capital for planting other crops such as rice.

- For example, the owner of the Model Agricultural Supply was identified by the farmers as the biggest agricultural supplier cum trader in Iloilo. The trader also supplies to farmers in Capiz and through his agents and middlemen, finances corn production. Main suppliers shipping corn seeds and inputs in Iloilo prioritize the trader's company. The financiers acquire supplies from him.

- In Cordon, Isabela traders charge 5-10% interest every month for 5 months. For example, if the farmer borrows Php5,000 after 5 months, it would be repaid by Php6,250. If the farmers fails to pay the principal and the interest on the fifth month, an interest of 5% will be charged on the principal and accumulated interest or Php6,250 x 5%. The loan and interest is compounded as in bank loans. Sometimes farmers pay one cavan of palay for every Php1,000 loan.

- In Banaban, Bayambang, Pangasinan financier-traders charge 5-10% every month for 4 months.

Traders would not lend again unless farmers pay up their loans. Farmers said they often receive invectives from the traders should they fail to pay on time.

- In Bgy. Macayo-cayo, Pangasinan, financier-traders charge farmers 30% interest in four months and add a high mark-up on agricultural supplies (e.g. seeds, fertilizers, pesticides) sold to farmers from Php200 to as high as Php1,500.

- The financier-traders in San Nicolas, San Dionisio, Iloilo charge farmers 5% interest per month on top of the mark-up on agricultural supplies bought by the farmers on loan.

- In Quinabonglan, Maayon in Capiz, traders charge interest of 5-6% per month. Corn farmers would sometimes work for the financiers to be able to repay debts.

- In Bgy. Carataya in Cuartero, the financier-traders charge 5% interest every month until harvest or 20% interest. Should farmers fail to pay in time, the interest is compounded for every month the farmers fail to pay. They also charge additional mark-up on regular prices of inputs.

- In Bgy. Bungsuan, Dumarao, the financier-traders come from nearby Passi and Cuartero. They charge 5% - 8% interest with additional Php10 to Php50 mark-up on the normal prices of inputs . Farmers sign an agreement with financiers. Some agreements are even notarized.

- In San Fernando, Bukidnon, farmers borrow cash from the traders-financiers. They are required to give collaterals such as land titles to avail cash loans. Most of the titles of the corn farmers are with the traders. Financier-traders collect a monthly interest of 10 percent. In nearby barangays of Kagalangan and Nakabuclad, 50% of corn farmers are now farm workers in their own farms as they are unable to realize profits from their corn farms and hence cannot pay their loans.

- In Malitbog, the corn farmers do not know their financier-traders. They avail of loans through guarantors and middlemen who they refused to name. They are charged 4% a month on their loans.

- In Banga, South Cotabato, the financier-traders charge an interest of 8% to 15% per month. Through buy and sell, interest is 10% per month and buying price of corn is 20 cents lower than prevailing price per kilo of corn

- In Bagumbayan, Sultan Kudarat, financier-traders charge an interest of 8% per month on items or cash loans plus additional Php20-30 mark-up per bag of inputs.

Some government officials avail of loan from the Land Bank of the Philippines (LBP) and lends to farmers at very high interest rates. For example one financier-trader corn farmer in Echague borrows from a certain municipal councilor of nearby San Guillermo Municipality. The councilor borrows from LBP at 12% interest per annum but relends to farmers at 30-35% interest per month. The corn farmers are enlisted as members of his cooperative without the farmers knowing so.

The corn farmers either go directly to their financier-traders or pass through a layer of guarantors who serve as go-between for the traders and corn farmers. The guarantors normally invest nothing, just their reputation and good financial standing with the traders, but earn so much from the interest on loans to the corn farmers.

Losing farmers' rights

According to farmers in Cordon, Isabela, it would take three cropping seasons of good harvest before farmers could recover from bankruptcy. There are also times when good harvests bring in so much cash to farmers they are able to buy their own tractors and threshers which they then rent out to other farmers for additional incomes. But these opportunities come by only once in so many instances of bad harvests.

With GM corn, traders now have control over farmers. Because they are indebted, farmers lose so much to financier-traders including control over their lands, as well as decisions on what crops to plant and which seed to plant, because traders would not lend to farmers unless they use GM corn. Traders also insist on which brand farmers should buy even if the farmers want another brand. Likewise, the farmers cannot choose which variety to plant as the traders would insist on selling one particular brand because of the incentives given by the seed companies should the traders reach a certain quota. In many cases, farmers are made to sign a blank paper by the traders to serve as proof of their terms of payment.

Box 3. Case Study of a Seed Grower in Mindanao

Mang Claro is a corn farmer for the past 15 years in Mindanao. He was contracted by one of the leading seed corporations in the country to grow GM Corn seeds. Back then he had 3.8 hectares of farmland – two hectares inherited by his wife and the other half he inherited from his parents. The first time he planted the GM corn for Pioneer, he was able to meet the quota and profit from the returns. The seed corporation shouldered all the expenses but these were deducted upon harvest. The next time his land was contracted for the GM corn seeds however the corporation sprayed on glyphosate to test it. However, it burned the corn plants. Apparently the GM corn seeds were being tested on his farm without his knowledge. The corporation did not pay Mang Claro for the damaged crop planted over his 2.2 hectares farm. The contract he signed with the corporation had a waiver on the insurance of the crops stating "insurance not obligatory". Mang Claro ended up bankrupt and had nothing to pay his debts that accumulated for the four-month corn cropping season. Added to this was the huge cost he had to pay for the hospitalization of his father who died later. Unable to pay his debts which had compounded, Mang Claro was forced to enter his 1.8-hectare farmland in Banga to Dole-Stanfilco under a lease-contract for a period of 15 years. Dole has already paid in the first five years equivalent to Php60,000 or Php12,000 a year or about Php33 per day for the 1.8 hectare farmlot which Dole-Stanfilco planted with its famous bananas. Mang Claro is not to touch his farm for 15 years.

Interestingly, most farmers interviewed would not admit that they are in debt. Key informant interviews with peasant leaders as well as barangay officials however revealed that almost all of the corn farmers planting GM corn have become so indebted to the traders that many of them have lost their rights over their lands. Traders would take over their lands and the farmers would become farm workers in their own lands.

To be able to pay, farmers would sell their livestock including their carabaos to the traders. Some farmers venture into livestock and poultry in order to finance their corn farming or for repayment of debts.

In some instances, others would hold on to their farms and not allow the traders to take over their lands. This is especially true in Echague. In Cordon, the farmers' association would try to save their members' lands from being taken over by the traders. Instead of surrendering their lands to the traders, the farmers would let another farmer from their organization to work over their farms until such time that they are able to earn and pay up and take the land back.

In San Dionisio, the wife of the former mayor took over the land of a corn farmer because of the latter's indebtedness. According to a corn farmer in San Nicolas, only five corn farmers in the community are not tied to financiers.

In Cuartero and Dumarao in Capiz, Agrarian Reform Beneficiaries (ARBs) have given up the lands awarded them through the government's land reform program through "prenda" or sold the land to the guarantor or trader to whom they are indebted. In many cases, the farmers lose the land completely because of additional loans made to the guarantor or trader for unforeseen expenses until the farmers can no longer pay up their accumulated loans.

In Dumarao, ARBs who chose to apply for individual CLOAs from the mother or collective CLOA earlier awarded them by the DAR have given up their rights to their lands either through prenda, or completely sold their rights over the land to the guarantor or the trader.

In other cases, the guarantors are also forced to give up their lands to the traders especially when farmers whom they guaranteed fail to pay their debts. A guarantor in Quinabonglan, Maayon even spent a night in jail because she was not able to collect from the farmers and pay the trader their due debts.

Farmers bear the humiliation of being shouted at and given invectives by the financier-traders. Others choose to leave and transfer to another place without options to pay up. One mother in Cordon, Isabela shared that the family would spend sleepless nights to save whatever there is worth saving from their corn harvests in order to pay for their mounting debts – *"Agsang-sangit kami lattan, pampanunutem ta nagadu utang mi, kasano kami nga makabayad ton…"* (We just cry as we ponder about our debts and how we will be able to pay up).

Farmers do not only lose their rights to the land but also their rights to resources. Apart from not being able to replant seeds, because GM corn, just like the hybrid corn, cannot be replanted to produce the same results, there is also the question on intellectual property rights (IPR) or patent rights. Seed corporations hold the IPR

over the seed technology and farmers are prohibited to replant and re-use the seeds for cross breeding with other varieties without paying royalties to the owner of the patent, the seed companies.

Impact on biodiversity

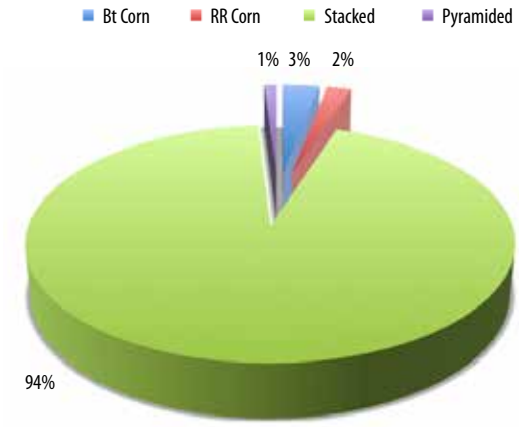
The most evident impact of wide-scale use of the GM corn is on the environment. Farmers complain about the loss of biodiversity, emergence of super pests and super weeds, increasing soil erosion and landslides, and the infestation of a plant disease that only recently affected thousands of hectares of corn farms in North Cotabato.

The introduction of the stacked trait variety of GM corn which is resistant to corn borer infestation and glyphosate application that eliminates weeds has apparently freed farmers from the labor-intensive task of weeding. It saved the farmers labor time including the time to wait before planting the corn seedlings. About 94% of the GM corn farms as of 2011 is planted to the stacked variety of the GM corn.

However, after continuous use of the stacked trait variety of GM corn, wild vegetation has disappeared, soils have become increasingly prone to erosion, and the GM corn itself has become vulnerable to plant diseases.

The farmers in all case areas also complain of not being able to plant vegetables and rootcrops near their GM cornfields. When using the stacked trait variety of GM corn, spraying the herbicide kills the vegetation in the immediate proximity. Herbicide drift affects the leaves of vegetables and deforms fruits. Pests also attack the vegetables including the fruits. Cassava and sweet potato become fibrous when planted near the cornfields, hence become hard and inedible.

Figure 5. % Share of GM Corn per Variety



In Mindagat, Malitbog, a farmer-leader complained that the fruits of his mangoes and bananas were deformed after farmers started planting GM corn and spraying herbicides near his farmlands.

Wild vegetables such as the wild bitter melon that grow in the farm have also disappeared. So are the fishes in rivers. White corn are also contaminated with GM corn. Farmers observe that earthworms are now very rare.

Super pests

New corn pests have also emerged like the corn plant hopper (CPH) or *waya-waya* observed in Pangasinan, Iloilo, Capiz, South Cotabato, and Bukidnon. In 2010, the waya-waya started infesting many of the corn farms in San Nicolas, San Dionisio, Iloilo where most of the farmers went bankrupt. The farmers tried to use Furadan but to no avail. The CPH apparently attacks every second cropping in December and January and the farmers suspect the GM corn has become vulnerable to the CPH. The pest attacks the Bt corn and stacked variety of GM corn.

Another pest, a tiny black insect according to the farmers has also infested corn farms in Capiz especially in Cuartero. They have tried to use the pesticide Karate to control it but the pest persists.

Farmers have also observed that the corn borer has started to infest even the GM corn, apparently having developed resistance to the Bt corn.

Worse, in Alamada, North Cotabato, about 9,688 hectares of corn farms equivalent to about 60,000 MT of corn have reportedly been infested by the Banded Leaf and Sheath Blight (BLSB) in early 2011. BLSB according to the DA-BPI is caused by *Rhizoctonia solani*, a soil-borne fungus that infects the corn plant from later whorl to ear formation. It usually infects corn farms during the rainy season. Infected corn residues such as leaves and stalks must be dried, burned or buried and deep ploughed under the soil to prevent spreading of the disease.

According to the Region 12 RFU Officer of the DA, the disease is traced to the no-till farming due to the incessant use of Roundup herbicide. Corn farmers have been advised to go back to deep ploughing.This

Corn borer damage on Pioneer 30Y80 Bt corn plant. Farmers have documented increasing corn borer damage on their crops, saying that the Bt corn are losing its 'potency' and that the corn borers are becoming more resistant.

would lose the sense of using glyphosate-tolerant GM corn but the RFU said only deep ploughing can stop the spread of BLSB. Likewise, another commonly observed illness of the GM corn is the stalk rot. Stalk rot is caused by several disease-causing fungi, with plants usually exhibiting diseased roots and crown.

Super weeds

Not only has the soil become prone to erosion, super weeds have also been observed. In Banga, South Cotabato for instance, the Roundup herbicide is unable to exterminate the broad-leaf vine-like "oyampong". Only 2,4-D is able to kill the weeds. Also in Cordon, Isabela, corn farmers use 2,4 D in their land preparation for corn planting.

Incidentally 2,4-D or 2,4-Dichlorophenoxyacetic acid is among the chemicals reported to have reproductive and endocrine-disrupting effects. It is classified by the World Health Organization (WHO) as Class II 'moderately hazardous' pesticide. This places it in the same class as endosulfan, lindane, paraquat and toxaphene – the first three are banned pesticides in the Philippines.

A hectare of Roundup Ready corn needs about 4 liters of glyphosate or Round-up Herbicide to kill weeds, which farmers apply twice per season. Rough estimate states that if there are 658,846 ha of RR corn and stacked trait corn (with herbicide resistance) in the country that use herbicides, then about 5,270,768 liters of herbicide are being sprayed in a season. This figure will double as there are two planting seasons of corn in the country. This is a far cry from the claim that GMOs would decrease the use of pesticides.

Infertile, aging soils

Farmers also observe that the soil has 'aged' faster than before, after planting GM corn. Farmers in all case areas complain they have to use increasing amounts of fertilizers to achieve good harvest. The soil has also become harder or compact and needs to be ploughed twice. Even mungbeans have to be applied fertilizers nowadays, unlike before GM corn when farmers would not need to fertilize the crop.

This tendency of the soil to become infertile even when applied with increasing amount of fertilizers is due to the continuous application of pesticides that affect the soil ecology, eliminating beneficial microbes and

Leaves of string beans affected by the application of Roundup ready (glyphosate) in combination with 2,4 D herbicide. Farmers said that RR corn, and the subsequent application of herbicide has affected their vegetables and fruit trees.

plant biomass that provide natural food and nutrient build-up in the soil. Chemical fertilizers also create an imbalance in the composition of the soil's natural nutrients. Excessive nitrogen in the soil for example causes acidity that leads to unavailability of some nutrients, thus causing deficiency or to the solubility of other nutrients which may lead to toxicity. These then leache out other necessary nutrients in the soil and eventually leads to soil nutrient imbalance.

The use of glyphosate (Roundup), increases the rate of soil infertility because it eliminates weeds down to its roots, hence eliminating the natural food for soil microbes that builds up soil nutrients. Meanwhile high yielding varieties (HYVs) like hybrids, including GM corn, are heavy absorbers of inorganic fertilizers and other micro-nutrients in the soil. Pests are attracted to these chemically enhanced and enriched plants. On the contrary, traditional corn varieties are generally pest-tolerant .

Soil erosion and landslides

Another effect of herbicide use in herbicide resistant GM corn is loosening of the soil, making areas planted to GM corn prone to erosion and landslide. One farmer complained that her rice field was destroyed when heavy rains caused heavy rainwater runoff from the upland cornfields causing heavily silted water to flood rice fields in the lowlands.

In Cordon, Isabela, the farmers complain of heavy rainwater runoff from the cornfields planted with the herbicide-resistant stacked variety particularly during the typhoon Quiel. Stones and rocks have begun to portrude when the topsoil eroded. In Banga, South Cotabato, the MAO also complained of soil erosion in his corn farm.

As a consequence, water bodies and rivers get heavily silted. One corn farmer in Capiz said that soil eroded from the denuded mountains where trees and forest vegetation had been replaced with the herbicide-resistant GM corn. They said that pesticides used in growing GM corn found their way downstream to the coastal waters of Puentevedra, causing silt build-up and poisoning marine life. Fishes and prawns have become scarce in the once abundant fishing area.

In San Fernando, Bukidnon, landslides in August 2011 were reported in areas planted with the stacked variety of GM corn. The Municipal Environment and Resources Officer (MENRO) also shared that they had difficulty with reforestation projects in the hilly areas because of

With the use of glyphosate, a herbicide that kills weeds, the once inaccessible grassy hillsides are now quickly cleared and prepared for GM corn planting. Most of the hilly areas in Quinabonglan, Capiz are now planted with RR Corn.

the spraying of glyphosate which killed all vegetation including tree seedlings in the immediate vicinity.

There is a need to study the extent of expansion of herbicide resistant corn in forests or hilly areas. The once inaccessible areas are now easily being cleared out and prepared with the use of herbicides, which may lead to further inundation of forest and wildlife areas and contribute to the increase in soil erosion. Most of the hilly areas are planted with RR corn where before, these are under natural vegetation.

Corn farms in 2009 had the highest rate of soil loss at slopes of more than 30 degrees. About 150 tons of topsoil per hectare were lost in areas planted to corn at slopes more than 30 degrees. Fifty tons of topsoil per hectare is lost in corn areas with 18-30 degrees slope **(Table 28).**

There is supposedly an unpublished impact research done by the ERDB of the DENR and funded by the USAID, but according to the ERDB, a more comprehensive study is yet to be done on the GM corn impact on the environment.

Table 28. Soil Loss for Various Land Uses by Slope Category (t/ha), 2009.

Land Use	Slope Category	
	18-30	>30
Rice	50	100
Corn with fallow	50	150
Other Agriculture	25	50
Forest	1	1

Source: Bureau of Soils and Water Management

Food insecurity

As a result of the loss of wild vegetables, including not being able to grow vegetables and root crops in or near GM corn farms, the regular diet of the farming families has been affected. Before, they did not have to buy vegetables because these used to be abundant in their farms and they could plant them alongside corn fields. Now they have to buy even kangkong (water spinach) and camote (sweet potato) tops.

Traditional white corn used for human consumption are contaminated with GM corn thru cross pollination, Echague, Isabela.

One important part of farmers' diet lost to planting GM corn is the glutinous white corn (kalimbugas) which farmers used to eat as an alternative staple or in combination with rice.

The farmers complain that they cannot eat the GM corn as replacement for rice or white corn because of uncertainty of its side effects. GM corn leaves a bitter taste in the tongue, as observed by farmers.

Before, the native corn could be mixed with rice, thus the farmers could save on rice. But they cannot do this anymore. And if they have nothing to eat, they risk eating the GM corn.

Table 29 provides a bird's eyeview of the loss of biodiversity and impact on farmers' food security from planting GM Corn.

Moreover, with the commercialization of GM corn, certain cultural practices have also been lost, such as the practice of communal farming or bayanihan (ammuyo in Ilocano, dagyaw in Ilonggo) where farmers help each other by working on each other's fields without pay. This takes place every land preparation time. Also with the decreasing farmland devoted to white corn and the decreasing number of farmers planting white corn, the culture of "*pasinaya*" or "*pasasalamat sa masaganang ani*" (thanksgiving for a bountiful harvest) where farmers gather together and enjoy their bountiful harvest of white corn is also almost gone. In Bgy. Mindagat, Ka Max laments this culture has slowly disappeared with the introduction of hybrid corn in the late 1980s and early 1990s.

Feeding on toxins

There are mixed responses from the farmers on the effect of eating GM corn or in handling the seeds when planting and harvesting.

All FGD respondents except for the farmers in Cordon, Isabela have experienced stomach pains, gas pains, diarrhea, shortness of breath, chest pains and coughing, itching, skin allergies and yellowing of skin after eating GM corn. Farmers have also experienced numbness of lips and tongue after eating boiled young GM corn in cobs.

Farmers have observed that every time the GM corn plants reach flowering stage, the incidence of asthma attacks among the children increases. Children passing by flowering GM corn fields also experience coughing. Farmers doing the spraying of herbicides suffer from headaches and shortness of breath as well as skin irritation.

Table 29. Impact of GM Corn on Environment and Biodiversity Resulting to Food Insecurity

Case Areas	Abundant Before GM Corn	Scarce During GM Corn	Impact on Environment
Villa Rey, Echague, Isabela	Wild boar, bananas - cordova, upland rice	Wild vegetables and other edible plants do not grow anymore	Scarce vegetation, acidic soil, silted rivers, only few fishes remain; tungro in rice and bananas; papaya fruits are deformed
Caquilingan, Cordon, Isabela	fish, vegetables, white corn	All food even vegetables are bought from the market.	Soil is easily eroded especially during the rainy season. Stones protrude out from the soil and the soil turns red and clayish. Corn leaves turn violet.
Banaban, Bayambang, Pangasinan	Ararawan or mole cricket (for food) used to be plenty, Liddeg or black kohol (usually cooked with coconut milk), gurami (Guorami), suso (edible snails), field rats (dagang bukid), mudfish (dalag), palakang bukid (field frogs), fish abound in rice fields, kamaro (similar to the mole cricket), white corn, gabi or taro, kamote (sweet potato), pechay, native chicken, talangka (river crab)	Vegetables, ararawan, black kohol, guorami, Suso, field rats, mudfish, river crab, white corn, fish became scarce. Almost all food is bought, even rice.	No more earthworms and other beneficial farm insects. ACB have become immune to the Bt corn. The soil has lost its nutrients as increasing volumes of fertilizers are needed to grow crops.
Macayo-cayo, Bayambang, Pangasinan	suso, black kohol, field rats, native catfish, taro, kamoteng kahoy (Cassava), kamoteng gapang (sweet potato)	There are now few wild vegetables and fish is bought.	Soil is acidic and has hardened.
San Nicolas, San Dionisio, Iloilo	Vegetables and fishes, root crops, traditional rice plus traditional white corn, native chicken	Vegetables are no longer abundant. Coconut, guava, rice field frogs , guorami, catfish	Corn Plant Hopper (CPH) or Waya-waya; bananas do not fully develop; the soil becomes dry, hard, and acidic; hilly portions of San Nicolas are already eroded
Quinabonglan, Maayon, Capiz	Rice and white corn are staple of farmers who were self-sufficient then. Vegetables and fruits abound; rivers were teeming with fishes	People now buy rice and only few vegetables are found; few fishes in the rivers	Soil gets easily eroded as there are no weeds and vegetation to hold the soil. Even trees are affected by glyphosate spraying; water supply has become scarce
Carataya, Cuartero, Capiz	Mountains and cliffs are covered with trees and wild vegetation	Trees and vegetation have become scarce	Marine life is poisoned with agro-chemicals run-off from the mountains; carabaos have become thin and sickly after eating corn fodder sprayed with Roundup; Growing cassava, camote and banana trees usually planted along rice paddy dikes is no longer possible
Bungsuan, Dumarao, Capiz	Vegetables, many trees before, and rivers were abundant with water and fish	Vegetables, no more trees, rivers have dried up	Stem borer, stalk rot, stunted vegetables if they survive RR spraying; soil erosion and rocks protruding out from the earth; water have become scarce, denuded hills and mountains
Halapitan, San Fernando, Bukidnon	Native white corn	Native white corn	Landslide, soil erosion, no more vegetation
Mindagat, Malitbog, Bukidnon	White corn	White corn	Traditional white corn gets cross-pollinated with GM corn; mangoes and bananas become sickly
Cinco, Banga, South Cotabato	Kulitis or Chinese spinach (Amaranth), vegetables – string beans, legumes, eggplant, tomatoes, freshwater fishes	No more freshwater fishes, vegetables have become scarce and now bought from the market; durian and bananas have become sickly and infested	Pests in asparagus and durian; soil has become acidic and loose hence prone to soil erosion
South Sepaka, Bagumbayan, Sultan Kudarat	Kulitis or Chinese Spinach (Amaranth), saluyot or jute, wild bitter melon, bananas	Bananas have become sickly and have fewer leaves	CPH started in 2011 during the dry season;

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These side effects are known acute effects of agrochemicals. **(See List 1)**

Illnesses observed to have become prevalent even among the young children are urinary tract infection (UTI), kidney and liver problems, high blood pressure and diabetes, and among the elderly, cancer. Birth defects have also occurred and have also become common like being born deaf or mute. These preliminary data needs to be verified under extensive health studies. No post monitoring is being done to date to assess these problems **(Table 30).**

Previous studies have been conducted among the Lumads in Polomolok, South Cotabato where the first field testing of the Bt corn was done. The results showed that the Bt toxin (Cry1Ac) was present in the serum of blood samples taken from the Lumads, the indigenous people, who complained of dizziness, nausea, and ill health after being exposed to the Bt corn. The findings however were rejected and disregarded by the government and local scientists.

Despite such experiences, the government apparently has not provided nor programmed a post monitoring system to assess the impact of GM corn on human health.

With plans to commercialize Bt eggplant and later on GM rice (i.e. Golden Rice) in the country, there is an urgent need for an extensive health safety testing and post release monitoring. The impact of consuming GM corn by farmers as well as on the livestock must be established before any other GM crops, especially GM food, is released in the Philippines. The Philippine government, priding itself as model country in biosafety, must exercise the 'precautionary principle', where until proven safe and until doubts are cast a product must not be tried, propagated and commercialized.

Impact on livestock and poultry

Farmers have observed that livestock, especially goats and cattle that eat GM corn leaves and stalks become sickly, suffering from diarrhea, while others have a hard time defecating. Carabaos and cows have been observed to lose weight and are sickly. In Caquilingan, Cordon, Isabela for example, five carabaos died in 2011 and when farmers examined the carabaos' stomachs, these were filled with undigested corn fodder.

Farmers also complained that native chickens fed with GM corn appeared disoriented and failed to lay eggs.

List 1. Some Acute Health Effects of Pesticides

numb lips, tongue	weakness, fatigue, lethargy
sore throat	dizziness
blurred vision	disorientation, confusion
Lachrymation	agitation
Headache	inarticulate speech
Salivation	depression
nose bleed	memory loss
Swelling	difficulty in walking
chest pain, tightness, wheezing	anxiety, restlessness
suffocation, difficult breathing	involuntary twitching
Sweating	hypotension, hypertension
Burning skin	drop in blood pressure
Itching	rapid pulse
Blisters	muscular pain, stiffness
discoloured irregular nails	muscle weakness
nausea, vomiting	back pain
abdominal cramps	seizures
diarrhoea	paralysis
uncontrolled urination	coma
vaginal pain	death

(Pesticide Action Network-Asia and the Pacific, 2nd Edition, 2010)

Farmers in South Sepaka in Sultan Kudarat shared that native chickens would always lay their eggs in one place. But once fed with GM corn, farmers noticed their native chickens laid their eggs just anywhere.

Farmers' choice or left without a choice?

The farmers have observed the various disadvantages of GM corn from unrealized incomes leading to bankruptcy and indebtedness, falling productivity, loss of biodiversity, environmental destruction, food insecurity, and threat to health. But with the situation they are in, they are left without a choice but to continue planting GM corn.

The DA and various MAOs say that they are presently pushing for and advocating organic agriculture and encouraging farmers to go back to the cheaper conventional hybrid yellow corn. However, with the ease of growing GM corn, easy access to loans and massive information campaign by companies, farmers have preferred GM corn over conventional corn varieties. GM corn contamination also affects the seed-saving practice of farmers. Farmers report that

Table 30. Illnesses Observed by Farmers Associated With GM Corn Propagation

Case Areas	Illnesses in Humans	Livestock and Poultry
Villa Rey, Echague, Isabela	Swollen lips after eating GM Corn, itchiness, stomach pains	Carabaos die after eating too much GM corn fodder
Caquilingan, Cordon, Isabela	UTI even among children, ulcer, blood in urine	Unexplained deaths of carabaos – five in 2011 after eating GM corn fodder
Banaban, Bayambang, Pangasinan	Itchiness especially when flowering stage, skin pruritis and allergies; diarrhea, gas pains, stomach acids	Livestock that consume GM corn fodder get sickly. Goats have loose bowel movement while cows become thin.
Macayo-cayo, Bayambang, Pangasinan	Stomach pains, diarrhea	None observed
San Nicolas, San Dionisio, Iloilo	Hypertension, diabetes, asthma	Livestock have become thin because there are no more grasses or wild vegetation for them to eat.
Quinabonglan, Maayon, Capiz	Farmers observe increasing incidences of UTI, ulcers, kidney problems.	None observed
Carataya, Cuartero, Capiz	None observed	Carabaos that have eaten corn leaves and stalks that have been sprayed with glyphosate have loose bowel movement.
Bungsuan, Dumarao, Capiz	Goiter, stomach pains, difficulty in breathing, allergies increase every flowering stage, hepatitis-B, those with illnesses are aggravated by eating GM corn	Carabaos that have eaten the GM corn fodder have loose bowel movement. One carabao eventually died, excreting blood a few days after eating GM corn fodder.
Halapitan, San Fernando, Bukidnon	Hypertension, diabetes, the skin of farmers and their families that eat RR corn turn yellow (jaundice).	None observed
Mindagat, Malitbog, Bukidnon	None observed	Swines and carabaos that get near the GM corn farms got sick.
Cinco, Banga, South Cotabato	Asthma and skin allergies especially during pollination, hypertension, liver and kidney diseases	Goat livers have been observed to have become abnormal, carabaos get thin and sickly, and eventually die
South Sepaka, Bagumbayan, Sultan Kudarat	Colds, fever, cough, asthma during flowering stage of the GM corn	Native hens have become disoriented, laying eggs anywhere

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GM contaminated varieties are becoming non-viable, therefore cannot be replanted.

Farmers who choose conventional or traditional corn have to plant earlier than those who plant GM corn. However, they cannot risk planting the corn seeds on wet soil as mud would clog the seed planting tool and waste the seeds in the process. Many farmers also want to plant the traditional white corn for additional food consumption but these would get contaminated with the GM corn. Farmers are anxious that the GM corn would eventually eliminate the traditional white corn.

The lack of irrigation also leaves farmers in rainfed areas without much choice but to plant corn which requires less water compared with rice. Farmers in Pangasinan shared that if only their lands were irrigated, they would plant rice instead of corn. The first cropping would be for selling and the second largely for saving up for food and selling whatever is left.

Farmers have come to the collective realization of the negative impact of planting GM corn on their livelihood, incomes, environment, biodiversity, food security, and family health. The most bitter realization is that they have become more indebted to the traders than ever before. And if farmers will not borrow for corn production, they will not be able to borrow for rice production and rice for consumption.

Smallholder corn farmers had hoped that a new technology introduced by corporate agents and the government would bring better harvests and incomes and better lives, but much like the bitter taste of GM corn, farmers have ended up deeper in debt and poverty.

Livestock such as goats (for food) and cows (food and farm work) are being fed with Bt Corn stalks at Bayambang, Pangasinan.

Endnotes

[1] Key Informant Interview (KII) with the Municipal Agriculture Office, Cuartero, Capiz, March 13, 2012

[2] KII with the Municipal Agriculture Office, Maayon, Capiz, March 13, 2012

[3] KII, with Region XII RFU in Koronadal, General Santos City, March 26, 2012; KII, MAO, Echague, Isabela, February 28, 2012

[4] KII, **Mr. Milo de los Reyes**, March 16, 2012

[5] KII, MAO, Echague, Isabela, February 28, 2012

[6] KII with contract grower for demonstration farm, San Dionisio, Iloilo. March 10, 2012

[7] Ibid.

[8] Various FGDs

[9] KII with Region VI RFU in Iloilo, March 9, 2012 and FGD in Cuartero, Carataya, March 12, 2012

[10] IBON-MASIPAG FGDs, February to March 2012

[11] KII, Bgy Captain Amado T. Villacanas, Jr., March 24, 2012, Bgy Cinco, Banga, South Cotabato

[12] La Filipina Uy Gongco Corp. is one of the biggest trading houses in Panay and Negros Islands involved in the trading of feeds ingredients, fertilizers, sugar, vegetable oils, grains and wheat flour. It also owns a sugar mill – the Capiz Sugar Central formerly the Elizaldes', flour mills, animal feeds mills, livestock farms, cargo ships, hotels, housing, a shopping mall, and a bank.

[13] From its establishment on June 29, 1982 through SEC Registration No. 121272, NABCOR has evolved to be a dynamic corporation responding to the needs and priorities of time. Originally from its mother corporation, the Strategic Investment Development Corporation (SIDCOR), an agency under the umbrella of the Office of the President, NABCOR was transferred to the Department of Agrarian Reform (DAR), and finally on August 09, 2005, NABCOR was transferred back to DA through another Deed of Assignment.

[14] FGDs in Carataya, Cuartero, Capiz and in Mindagat, Malitbog, Bukidnon on March -- and --, 2012

[15] FGD in Quinabonglan, Maayon, Capiz March 11, 2012

[16] KII, Bgy, Kagawad Maximo Narvasa, March 23, 2012, Mindagat, Malitbog, Bukidnon

[17] KII MAO, Echague, Pangasinan; BPI Bio-Tech Core Team

[18] KII, BPI focal person for field monitoring; Approval Registry Of Regulated Articles For Propagation (As Of February 23, 2012), Bureau of Plant Industry

[19] Memorandum from the Bureau of Plant Industry (BPI) Director Clarito M. Barron to Asst. Secretary Edilberto M. De Luna of the National Corn Program of the Department of Agriculture, August 22, 2011 on Banded Leaf and Sheath Blight

[20] Ibid.

[21] KII, Mr. Zaldy M. Boloron, Region 12 Regional Field Unit Officer of the Department of Agriculture, March 26, 2012

[22] KII, Mayor Henry Ladot, Banga, South Cotabato, March 12, 2012

[23] Pesticide Action Network-UK, December 1999; See also banned pesticides in the Philippines, Fertilizers and Pesticides Authority

[24] KII, Bgy. Kagawad and Head of Bgy. Committee on Agriculture, ----, February --, 2012

[25] See http://www.gardenguides.com/125742-organic-fertilizer-vs-inorganic-effects-environment.html, and http://www.malcolmbeck.com/ books/gv_method/FertilizerOrganicNaturalversusChemicalInorganic.htm

[26] KII, Ka Pecs, MASIPAG, Region XII, March 26, 2012

[27] FGD, Bgy. Halapitan, San Fernando, Bukidnon, March --, 2012

[28] KII, Bgy. Kagawad, Caquilingan, Cordon, Isabela, February --, 2012

[29] KII, MAO Jeffrey Esterella, Banga, South Cotabato, March 26, 2012

[30] FGD, Bgy. Carataya, Cuartero, Capiz, March 12, 2012

[31] KII, MENRO Henry Halina, San Fernando, Bukidnon, March – 2012.

[32] KII with farmer leaders in Echague, Isabela an d Malitbog, Bukidnon, February 25, 2012 and March --, 2012

[33] KII, BPI-Biotech Core Team, April 11, 2012

[34] See also http://www.wsdot.wa.gov/NR/rdonlyres/A72C98BF-88CD-4BAA-9B0F-5BB709A0C564/0/glyphosate.pdf, factsheet developed by the Oregon State Universoty and Interfox, Incorporated. (…in a long-term feeding study, glyphosate caused changes in urine, increases in liver weights, decreases in body weight gain, and increases in the number of cataracts (damaged eye lens) and lens)

V. People's Resistance

MASIPAG was borne out of the farmers' fervent desire to regain traditional rice varieties which were lost to the modern technology of high-yielding varieties (HYVs) introduced during the Green Revolution. The network of farmers, nationalist scientists and local non-government organizations has for more than twenty-five years worked towards a holistic farming technology that not only conserves the vast wealth of agrobiodiversity but honors and enrich the inherent knowledge and wisdom of the farmers.

Farmers have a collective responsibility in feeding the society, being stewards of the land and genetic resources. To fulfill this huge task, farmers' rights to genetic resources, technology, land and decision-making should be respected and protected.[1] Genetically modified organisms violate theses rights, erode biodiversity and promotes the privatization and control of Agrochemical TNCs over genetic resources and farmers' livelihoods.

From the beginning, the introduction of GMOs into the country has been met with widespread protests from farmers.

Protests against Bt corn

As early as the late 90s, MASIPAG has been at the forefront to stop the field testing of Bt corn. MASIPAG engaged in massive education and lobbying campaign to raise the awareness of farmers and policy-makers on the potential harm of the GM crop. Together with multi-sectoral alliances with farmer networks, scientists, consumers, academe and advocates, intensive lobbying were done to halt the Bt corn field trials in Bay, Laguna and General Santos City, where local ordinances banning the field trials were successfully passed. On August 29, 2001, more than 800 farmers, faith-based organizations, students, indigenous people, women, consumers and other sectors took part in the trampling of GM corn in the Agroseed experimental site in Tampakan, South Cotabato. It took them only three minutes to destroy all the GM corn

plants in the 1,700 square meter experimental site. Agroseed is a branch of Monsanto in the Philippines.

The uprooting was a fierce expression of the farmers' disgust and protest against the Bt corn, and yet it was still approved for commercialization. Rather than be doused and suppressed, MASIPAG realized the value of a united, educated and empowered grassroots as the better and more effective way to resist the ever-persistent and deceptive GM technology.

Local lobbying and banning of GM corn

Despite strong resistance from the people, then secretary of the Department of Agriculture Leonardo Montemayor issued Administrative Order No. 8 in April 2002, which allowed and regulated the entry of GMOs as food, feed and processed product. Civil society organizations filed a moratorium on the implementation of DA AO8. The group questioned the legal procedures and safety measures as basis for the approval of the commercialization of Bt corn, and held an indefinte hunger strike in front of the DA office. On May 9 2002, MASIPAG held a solidarity fasting wherein more than 1,500 farmer members from all over the country did not eat for a day to express their protest against the commercialization of Bt corn. In Visayas, MASIPAG was able to gather more than 7,000 signatures calling for a moratorium of DA AO8.[2]

Prior to the infamous DA AO 8, several other legislative and judiciary actions were conducted. On February 21, 2000 charges were filed before the Supreme Court against government officials and scientists responsible for the regulation of the field tests. The complainants also asked for a Temporary Restraining Order (TRO) to prevent the importation and planting of Bt corn, and the permit issued to the companies be nullified.

Realizing the seeming failure of these national institutions to heed the call of peoples' organizations, MASIPAG took inspiration in its farmer-led and empowerment principle to strengthen the community against the onslaught of Bt corn. Education and capacity-building activities among the POs and community leaders were conducted, equipping them with skills and building their confidence in undertaking local advocacy campaigns. Farmer leaders become effective in discussing the perils of GMOs, while at the same time emphasized the better option to pest and diseases management – sustainable agriculture.

Campaigns were then decentralized to the regions and the provinces, where the farmers and their POs led the lobbying, education and protest against Bt corn. In Central Mindanao, for instance, intense mass campaigns and the convening of multi-sectoral alliances against development aggression resulted to the approval of village-level resolutions and ordinances preventing the entry of Bt corn. On May 2004, around 1000 farmers, NGOs, scientists, church groups rallied against the Monsanto office in General Santos City where they expressed their disgust at Monsanto's deceptive projects and actions, especially directed towards the agricultural sector.

Box 4. Anti-GM corn Legislative Measures

- Several local government units (LGUs) supported the opposition and campaign against GMOs, such as declaring their jurisdiction as "GMO-free". Among the first to make such a declaration was 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. Other provinces, such as Negros Oriental and Negros Occidental declared the island of Negros as "organic island of the Philippines". The provinces of Marinduque and Mindoro Oriental also passed similar ordinances against the entry of GM crops.
- A ban on Bt corn was declared in certain municipalities in the provinces of Bukidnon, Iloilo and Capiz.
- In 2005, the DA in Iloilo banned Monsanto's GM corn variety.

MASIPAG farmer groups also actively involved other sectors and formations to build or join alliances not only against GMOs but largely to protect farmers' rights and the conservation of environment. In late 2003, I-RESIST or Iloilo Resistance against GMOs was formed together with Paghugpong sang mga Mangunguma sa Panay kag Guimaras (PAMANGGAS) – the Panay-wide federation of farmers' organizations and MASIPAG Visayas together with CADI as well as the Jaro Social Action Center (JASAC). The alliance maximized the use of radio-hopping, television guesting, press releases and distribution of written paraphernalia on GMOs.

Multi-sectoral alliances in Mindanao also played a vital role in drumbeating the issue against GMOs and other environmentally-destructive projects and technologies.

Sustainable Agriculture

The most notable contribution of MASIPAG in the decade-long struggle against GMOs is the concrete and sustainable agricultural practice that provides solution to the problems that GMOs are supposedly addressing. For more than 25 years, MASIPAG farmers have developed a wide variety of pest and disease management systems that are ecologically sound and are cost effective. Detasseling, observing proper time for planting, use of certain IMOs are some of the recognized management practices to help lessen pest attacks. MASIPAG farmers, who are trained to become scientific in their approach to farming production, who are confident in their inherent know-how are able to come up with appropriate solutions.

For instance, Maximo Narvasa, an active MASIPAG farmer-leader in Mindagat, Malitbog, Bukidnon plant two weeks ahead or two weeks later from the planting of GM corn to avoid contamination of their white corn. Along with other members of the Mindagat Integrated Sustainable Farming Association or MISFA, they practice organic farming and SA, which includes planting native white varieties of corn. Realizing the threat of GM corn in their farms, he filed a resolution as a barangay councilor banning GM corn in their barangay. Maximo and his group also tried to convince the Municipal Agriculturist Officer to exclude GM corn in their program and strengthen organic farming promotion. Maximo chooses to practice sustainable agriculture because he believes that the government's food security thrust only seeks to produce food, without ensuring its safety.

MASIPAG has also started the formation and protection of ecological islands in several remote areas – where traditional corn varieties will be conserved against contamination of GM corn through isolation. In 2006, the MASIPAG Research and Ecological Farm was established in San Dionisio, Iloilo which provided venue for farmers education on Sustainable Agriculture. MASIPAG-Visayas concentrated on organizing and educating farmers on SA and applying it to solve problems on pests. Meanwhile, traditional white corn is being promoted in Leon and Alimodian in Iloilo, and in Antique and Negros. Seven barangays in Alimodian in Iloilo have been declared as biodiversity and GMO-free areas. The agriculture office in Alimodian does not allow corporate technicians to promote GM corn to farmers in their municipality.

In Capiz, local farmers federations are campaigning for diversified and integrated farming systems (DIFS) versus the monocropping practices promoted thru GM corn propagation. The Kahublagan sang Mangunguma sa Capiz (KAMACA) has been active in the campaign against GMOs and has promoted among its members sustainable agriculture strategies with MASIPAG-Visayas.

MASIPAG's program of diversification and integration farming system (DIFS) can effectively address the alleged problems that GM corn is trying to solve. Various cultural practices can help avoid pest infestation while at the same time securing the food and some income for the family. Farmer-led breeding and selection, contributes to the conservation and improvement of genetic resources like native white corn varieties.

MASIPAG acknowledges the long and difficult path to becoming totally GMO-free. For one, agrochemical TNCs such as Monsanto will continue to use their vast resources to influence, manipulate and deceive governments, academics, scientists, farmers and consumers that they need and they want GMOs. This paper should serve to expose the failures of GM corn and encourage the farmers to shift to more sustainable corn production. MASIPAG has previously published "Selling Food, Health and Hope: The Real Story Behind Monsanto Corporation" exposing the lies of Monsanto and the plight of countries that fell to the control of Agrochemical TNCs.

Unwavering, Undefeated

To date, MASIPAG and other anti-GMO alliances are actively campaigning against the field testing and eventual commercialization of two important crops in the country, Bt eggplant and Golden Rice.

May 2, 2012, the Supreme Court issued a Writ of Kalikasan (Writ of Nature) against GM eggplant field trials. Cases were filed in court by fellow petitioners Greenpeace, MASIPAG, former Senator Orlando Mercado, Puerto Princesa Mayor Edward S. Hagedorn, Rep. Teodoro Casiño, lawyers Harry Roque and Maria Paz Luna, scientists Dr. Ben Malayang III of Silliman University and Dr. Romeo Quijano of UP Manila, Leo Avila of the Davao City Agriculturist's Office, Catherine Untalan of Miss Earth Foundation, and activist-musician Noel Cabangon. The petition seeks legal remedy to the flawed regulatory system that has allowed the unhampered proliferation of dangerous GMOs in the country.[3] [4]

The Writ of Kalikasan is sought to immediately halt the Bt eggplant field trials. The petition presses the need

to take precaution given the scientific uncertainties on the safety of GMOs. It puts to question the flawed government regulatory process for approving GMOs and highlights the need for a genuine and comprehensive process of informing and consulting the public. The writ is sought to ensure that the health of the people and environment are protected before any GMOs are released into the open. The petition also seeks a continuing mandamus and temporary environmental protection order (TEPO) to stop the multi-location field trials and eventual commercialization of the Bt eggplant.[5]

Meanwhile, MASIPAG and anti-agrochemical TNCs alliance RESIST! are holding information dissemination campaigns on Bt eggplant and Golden Rice, conducting national and regional forums as well as legislative lobbying against GMOs. Two important House Bills await approval at the Philippine Congress, House Bill No. 2124 or otherwise known as the "GMO-free Food and Agriculture Act" authored by Representative Rafael Mariano, and House Bill No. 5247 or "Genetically-Modified (GM) Food Labeling Act" by Representative Teddy Casiño. In Davao City, a resolution has been filed seeking to declare the city as GMO-free following the uprooting of Bt eggplants at the UP Mindanao Campus in 2010 on orders of Mayor Sara Duterte in Davao. The municipality of Sta Barbara in Iloilo and Brgy Pangasugan, Baybay, Leyte also passed similar resolutions preventing the GMO field trials in their area.

The passage of the Philippine Organic Agriculture Act, Republic Act 10068 proved helpful in supporting the local organic agriculture movement vis-à-vis the campaign against GMOs. Citing RA 10068, organic agriculture practitioners and advocates lobbied for a ban on the use and importation of GMOs. During the National Organic Agriculture Congress held in Cebu last 2012, more than 1,700 participants unanimously passed a resolution seeking for a ban on GMOs. The resolution also asked the national government to assess the impacts of GMOs in the Philippines.

Endnotes

[1] MASIPAG's Statement on Farmer Rights, Adopted at a Workshop, Defend Farmers' Rights from Threats of the Philippine Plant Variety Protection Act of 2002, Doña Jovita Resort, Laguna, Philppines, 2-4th August 2002
[2] SUHAY, the official publication of MASIPAG, Januray 2004
[3] "Legal remedy vs. GMO invasion sought: Greenpeace files writ of kalikasan asking SC to stop GMO talong field trials", April 26, 2012, accessed at http://www.greenpeace.org/seasia/ph/press/releases/Legal-remedy-vs-GMO-invasion-sought/
[4] Punay, Edu. "SC issues writ vs GMO eggplant". The Philippine Star, May 15, 2012, accessed at http://www.philstar.com/Article.aspx?articleId=807126&publicationSubCategoryId=68
[5] Greenpeace, April 26, 2012

Farmers poorer after ten years of GM Corn

For ten years, the Philippine government has banked on the principle that in order to address poverty and hunger, agricultural productivity must be increased with the use of modern technologies. The government, in collaboration with TNCs and local businessmen are one in voice that GMOs will be able to improve the lives and livelihood of corn farmers, increase yield and mitigate the effects of climate change. Such is the belief to the technology that GMOs are also promoted as one way for the country to achieve the Millennium Development Goals (MDG) of halving poverty and reducing hunger. Since 2002, a steady stream of GMO products has been flooding the farmers fields and eventually into our food systems.

But concerns regarding the effects of GMOs on human health and the environment had been raised. These concerns are now being backed by numerous peer-reviewed studies by scientists and experts stating that GMOs are unsafe for livestock and human consumption and harmful to the environment. Economic gains of farmers from GMOs are uncertain. Numerous protests were staged, raising public awareness and gaining support from different sectors including local governments. Ten years after, GM corn has completely changed the landscape of corn farming in the country, in a negative way.

This study has falsified the claims of the Philippine government and TNCs, of improved farmers' livelihoods and economy thru GMOs. Ten years of experience is long enough to conclude that GMO propagation and commercialization has further indebted and impoverished farmers and only benefited agrochemical TNCs, financier-traders and local officials by extracting super-profits from them.

1. **Effect on incomes, health and environment.**

   a. The various case areas studied mostly reveal bankruptcy of smallholder farmers and landless tenants who plant GM corn. These are true especially for many who are dependent on financier-traders for their GM corn production as well as the everyday needs of the family.

      GM crops need more fertilizers and inputs to ensure yield. The increased use of fertilizers and herbicides has only added to the costs of production of farmers and defeated further the purpose of increasing income. Only a fraction of the corn farmers are not indebted to trader-financiers. Most often, farmers find other means to earn to offset expenses, as they cannot rely on GM corn alone to provide the needs of the family.

   b. Farmers cannot go into diversified food production, as GM corn farming displaces common and alternative food sources. Herbicide tends to kill all plants other than the RR corn. It also induces soil erosion thus taking away the health of the soil. Even if they do not practice GM corn farming, farmers also need to consider the adjacent GM corn farms, and its accompanying effects such as herbicide drift, pests and diseases that can affect their crop.Traditional white corn production which used to be an alternative staple of farmers has also diminished and is under threat of contamination by GMOs in many of the case areas. Overall, food security of farmers has diminished.

   c. Since corn is traditionally eaten, it is no surprise that farmers and their families eat GM corn. In all of the case areas studied, hypertension, diabetes, cancer, renal diseases as well as urinary tract infection, liver and kidney problems are observed to be present and increasing since the introduction of GM corn. Acute allergic reactions to pesticides such as asthma, difficulty in breathing, skin allergies and pruritis or swelling, chest pains, numbness, stomach pains associated with gas pains, diarrhea, and headaches have also been experienced in all the case areas. Likewise for livestock and poultry, deaths and increased susceptibility to illness after consuming GM corn fodder are also observed.

   d. The introduction of GM corn made a huge impact on the environment. Effects such as soil erosion and landslides associated with the use of glyphosate herbicide cannot be ignored. Soil acidity and ageing are likewise common for all the case areas. Emergence of new pests and super weeds resistant to glyphosate has also been documented, which also triggered the use of more pesticides and herbicides. The increased use of chemical inputs also negates the hype that GMO plants reduce the use of agrochemicals harmful to environment and contributing to climate change mitigation.

2. **Operations of agrochemical transnational corporations (TNCs), landlords, traders, local government, and corporate scientists in promoting GMOs propagation in the country**

   a. Agrochemical TNCs gained from the introduction of GMOs in the country. They serve as the primary source of inputs for the production of GM corn. They supply the necessary inputs through the trader-financiers in the various provinces in the country who also serve as the primary promoters of GM corn and inputs. They can dictate which seeds to plant and which inputs to use.

Agrochemical corporations have been successful in penetrating the local corn industry. They use sales agents and corporate technicians to market GM corn to local communities. They bridge the farmers to the financier-traders to buy the seeds and inputs. The TNCs strategy to deceive farmers thru information drives, variety branding, networking and other marketing strategies has resulted in the farmers' adoption of GM corn use in the country, even if they are not aware of the implications of using the product.

b. The traders and financiers also gained from GM corn business. Given that GM corn inputs are very expensive for farmers, they can provide the inputs either on loan or cash basis. Traders then charge a monthly interest rate of five percent to as high as 15 percent. They have guarantors who guarantee farmers in order for the latter to get credit from the traders. Guarantors have a cut in these varied levels of interest rates. Traders and guarantors extract usurious interest incomes from the farmers from additional mark-up on prices on inputs which they charge the farmers who borrow the inputs.

   These traders operate either in one municipality, province, regional or various regions, depending on their capacity to finance operations, and to a certain extent, political connections. Local government officials benefit from the supply value chain of GM corn production as many of them are also landed families and have established businesses in agricultural trading.

c. The government on the other hand, is very accommodating with regards to GMO adoption. Aside from very lax regulatory processes on the approval of GMOs for feeds or food, it is also providing GM seed subsidies to farmers.

It has also aided in the introduction of GM corn by facilitating channels of communication between corporate agents and corn farmers at the barangay level or identifying corn farms for demonstration and field testing of GM corn. LGUs also hold provincial corn congresses to invite players in the industry as venues for encouraging more investments in the corn sector.

The process in regulating and monitoring GMOs in the country remains vague and inadequate. The Philippine government to this day through the BPI and the NCBP has remained evasive in making the process of GMO approval transparent, scientific, independent and which promotes public interest. The DOH and the DENR, both crucial government agencies in the regulation and monitoring of GMOs, have yet to formalize its procedural guidelines. It is quite appalling that about 67 GMOs are already approved by the government, while clearly there is an absence of such guidelines in the last ten years. These acts show negligence in ensuring the health and safety of the Filipino population and the environment.

Also, government support is either lacking or non-existent for farmers who want to revert to traditional or organic farming. Even with the Organic Agriculture Act in place, there seems to be confusion among government units on how to promote organic agriculture.

Although the government procures corn products from farmers, it is not enough to compete with local traders. The local pricing and buying of corn products are thus being monopolized by corn traders, leaving farmers without choice but to rely on them.

3. Changes in the structures of ownership and control over the land, natural and genetic resources as results of planting GMOs.

a. Corn farmers' indebtedness leads to their loss of control over decision-making processes in farming. Definitely, farmers have no control on what seeds to plant. As corn farmers are now heavily reliant on seeds sold by traders, farmers have no choice but to buy whatever is being peddled by traders. Even if they want to go back to planting other types of corn varieties, they have no choice as traders would deny loans for their corn production and consumption needs.

GM corn contamination also affects the seed-saving practices of farmers, as farmers report that GM corn contaminated varieties are becoming non-viable and cannot be replanted. They are now losing these traditional seeds, some eventually abandoned planting traditional varieties of corn. Farmers are left with no choice but to stick with the GM corn seeds and their inputs.

Farmers also have no control over prices of their corn produce. Traders control the price of inputs, and they also control the buying price of corn. Since most farmers are indebted to the traders, they are always in a disadvantaged position.

Farmers' lands, either inherited or awarded through the government's land reform program, are used as collateral in obtaining loans from traders. The farmers, many of which are agrarian reform beneficiaries, have already lost control over their lands either to traders or their guarantors. Many end up as farm workers in their own lands. Ultimately, GM corn contributes to the loss of the means of production. GM corn planting is a debt trap for farmers.

Farmers' demands

Clearly, the impact of the introduction of GMOs specifically GM corn, is not the modernization of agriculture or feeding the nation but opening the Philippine market for endless profits by Agrochemical TNCs. GM corn introduction benefits the few while effectively marginalizing the vast numbers of corn farmers.

Today, many farmers are experiencing the negative impact of GM corn farming on their incomes, driving them deeper into indebtedness, with many of them losing their land rights. Many do not own the land they till and hence are doubly burdened with land rents and higher costs of production. Traditional seeds have become hardly available.

This situation must be reversed in order to halt the corn farmers' deeper slide into hunger, poverty and landlessness. There is still time for action. We in MASIPAG thus propose:

1. Termination of all GMO field tests and recall of GM seeds or products released in the market.

2. That the public, especially small farmers, be given the right to information on the effects of GMOs. An independent and full assessment of the impacts of GMOs on the socio-economic, health, and environment should proceed for the public to have an informed decision. That GMO seeds and products should carry these information and appropriately labeled.

3. That an independent investigation be conducted to review the process of government regulation and monitoring of GMOs in the country be sought. The investigation should determine if the adoption of GMOs were favored in return for personal gains such as additional project funding, personal perks, new positions, etc. The investigation should include persons involved, conflict of interests, source of funding, and other pertinent information.

4. Companies should be held accountable to the negative impacts brought by GMOs. If found that the grounds are sufficient, Filipino farmers and consumers should seek legal remedy against Agrochemical TNCs, including the Philippine government, for putting the health of the Filipino people and the environment at risk. Agricultural farms and the immediate environment exposed to GMOs and accompanying chemicals should be rehabilitated and restored. Just compensation to farmers whose corn farming activities was affected due to contamination, or whose health was affected due to consumption or exposure to GMOs.

5. Enactment of legislation that safeguards the right of farmers and the consumers against the effects of GMOs. Protection of farmer's rights to seeds and technology.

6. Promotion of Sustainable Agriculture as an alternative to chemical farming to ensure food self-sufficiency and alleviating livelihood of practitioners. Safe and sustainable corn farming practices should be promoted to encourage farmers to veer away from chemical/GM corn farming. Promotion of farmer-led breeding for the farmers to reclaim their control over seeds and technology.

7. Improve the country's grains marketing and trading system to remove cartels and monopolies. Increase the government's corn procurement to further strengthen the local corn industry. Government support for those who want to convert back to traditional or organic farming should be existing. Support should be given to small scale farming that use biodiversity and agroecological systems to attain food security and sovereignty. Government should do away with the chemical, capital and GMO-intensive and "business-as-usual" type of agriculture.

Beyond the destructive practice of GMOs and chemical farming on their livelihoods and incomes, farmers also face the lack of control over the lands and resources. Many farmers are still landless despite government's claims of achievement under its defective land reform program. Coupled with landlessness is farmers' lack of access to support subsidies such as capital, credit and inputs that would help them improve their livelihood to free themselves from indebtedness to traders and financiers. Therefore, a genuine comprehensive agrarian reform program should be implemented along with other programs to ensure sustainability of beneficiaries' land ownership.

In sum, much remains to be achieved in the people's struggles against GMOs in the country. But the small farmers' role in sustaining and preserving traditional knowledge, preserving and propagating the seeds remains as the core and future of all our struggles against GMOs and against corporate control over Philippine agriculture.

Appendices

APPENDIX 1: List of Respondents/Key Informants Interviewed

Office	Government Official Interviewed	Date Interviewed
Department of Agriculture		
Biotechnology Program Office	Dra. Candida Adalia, Head	20-Mar-12
Corn Program	Mr. Milo D. delos Reyes Head, Secretariat of Corn Program	16-Mar-12
Fertilizer and Pesticide Authority		
Pesticide Division	Mr. Augusto Canlas Deputy ED for Pesticides, Head of Bio-tech Core Team of FPA	10-Apr-12
Bureau of Plant Industry	Ms. Aida V. Ordas, Chief	4-Apr-12
Bio Tech Office	Thelma Soriano, Head	11-Apr-12
Bureau of Soils and Water Management	Focal person for Field Monitoring	11-Apr-12
	Rodel Carating, Senior Science Research Specialist, Integrated Soil Resources Information Service (ISRIS)	20-Mar-12
Bureau of Animal Industry	Dr. Efren Nuestro, Director	28-Mar-12
Animal Feeds Standard Division	Dr. Angel Mateo, Chief	28-Mar-12
DA-Region VI	Ricardo B. Saltin, Corn Coordinator	9-Mar-12
DA-Region X	Larry E. Paraluman, Corn Coordinator	19-Mar-12
DA-Region XII	Zaldy M. Boloron, Corn Coordinator	26-Mar-12
DOST, Office of the Undersecretary for R&D	Ms. Julieta Fe L. Estacio Project Devt Officer IV, DOST Secretariat, NCBP and DOST Biosafety Committee and Focal Point, BCH-Pilipinas	19-Apr-12
Department of Environment and Natural Resources		
Ecosystem Research Development Bureau	Ms. Vera Sinohin	11-May-12
	Dr. Carmelita Villamor	11-May-12
National Agribusiness Corporation-NABCOR	Maria Jayd-da Mayoralgo, VP	20-Apr-12
Philippine Association Of Feed Millers, Inc.	Ms. Ely Miranda	16-Apr-12
Institute of Plant Breeding-UPLB	Dr. Artemio Salazar, former IPB Deputy Director	30-Mar-12
Municipal Agriculture Offices		
Echague, Isabela	Mr. Ernesto B. Mabassa	
Bayambang, Pangasinan	Mr. Delfin Bravo	29-Feb12
	Ms. Mercedes Peralta, Corn Coordinator	29-Feb12
	Mr. Eduardo Angeles, Agricultural Technician	29-Feb12
Maayon, Capiz	Ms. Adelia Daypalan, and the Coordinators for the Rice and Corn Programs	12-Mar-12
Cuartero, Capiz	Mr. Benjamin A. Gutierrez	13-Mar-12
Dumarao, Capiz	Rice Program Coordinator	13-Mar-12
Malitbog, Bukidnon	Ms. Judith S. Saguinhon	23-Mar-12
Banga, South Cotabato	Mr. Jerry A. Estrella	26-Mar-12

APPENDIX 1: List of Respondents/Key Informants Interviewed

Office	Government Official Interviewed	Date Interviewed
Municipal Environment Office		
San Fernando, Bukidnon	Mr. Henry Halina	21-Mar-12
Provincial Councilor		
Isabela	Hon. Marcelino Espiritu	23-Feb-12
Echague, Isabela	Hon. Bobot Castillo	
Mayor's Office		
Maayon, Capiz	Hon. Wilfredo Borres, Sr.	12-Mar-12
Malitbog, Bukidnon	Hon. Aida B. Dela Rosa	23-Mar-12
Banga, South Cotabato	Hon. Henry L. Ladot	26-Mar-12
Barangay Officials		
Villa Rey, Echague, Isabela	Mr. Sabino Vicente	22-Feb-12
Caquilingan, Cordon, Isabela	Bgy. CouncilorErlinda Agustin Valerio	25-Feb-12
Banaban, Bayambang, Isabela	Bgy Captain Franco Macaraeg, Bgy Councilor Fortuna - Committee on Agriculture	26-Feb-12
Macayo-cayo, Bayambang, Isabela	Bgy Councilor Mario - Committee on Agriculture, Bgy. Councilor Joseph Bautista	28-Feb-12
San Dionisio, San Nicolas, Iloilo	Bgy. Captain Rogelio Bernal	9-Mar-12
Quinabonglan, Maayon, Capiz	Bgy. Captain Rogelio dela Cruz, Bgy. Councilor Ferdinand Tumlos	11-Mar-12
Carataya, Cuartero, Capiz	Bgy. Captain Melvin E. Cocjin	12-Mar-12
Bungsuan, Dumarao, Capiz	Bgy. Councilor Josefina Reymundo	14-Mar-12
Halapitan, San Fernando, Bukidnon	Bgy. Captain Norberto I. Catalan	21-Mar-12
Nacabuclad, San Fernando, Bukidnon	Bgy. Captain Henry G. Camaling	21-Mar-12
Mindagat, Malitbog, Bukidnon	Bgy. Captain Dionesio D. Kelim	23-Mar-12
	Bgy, Councilor Maximo Narvassa, Bgy. Agriculture Officer	22-Mar-12
Cinco, Banga, South Cotabato	Bgy. Captain Amado T. Villacanes, Jr.	24-Mar-12
South Sepaka, Bagumbayan, Sultan Kudarat	Bgy. Captain Audy Anthony Gaucho	25-Mar-12

APPENDIX 2: Profile of Case Areas

Bgy. Villa Rey is approximately 24 kilometers from the Centro Poblacion of the Municipality of Echague, Isabela – one of the top corn producing municipalities in Isabela.

Based on its 2008 barangay profile, Villa Rey has an approximate land area of 1,044.76 hectares, 70% of which is hilly and only 30% is lowland. Its total agricultural land is 425.05 hectares (40.68% of total), of which, 345 hectares (500 hectares according to farmers interviewed) or 81.12% is devoted for corn production with an annual yield of 2.7MT. Other crops are banana (50 has.), vegetables (22.5 has.), and palay (7.8 has.). At the time of the field research, there were parcels of land planted to pineapples. The average farm size is between 1 to 4 hectares.

Farming is the primary source of income where 78.41% of the population are engaged in farming. Employed work follows next comprising 18.18% of its working population. The rest are self-employed.

Purok 2 in Bgy Caquilingan, Cordon, Isabela is about 600 hectares. Bgy Caquilingan has more than 1,000 households. Farming is the primary livelihood, where the main crops are corn and palay. Thirty percent of the population are contractual laborers, 25% are farm laborers and 5% are into carpentry and engage in housework. The rest are under regular employment, have their own small business like restaurants, vulcanizing shops, etc. Other sources of income include gold panning, livestock and poultry raising, buy and sell business.

Majority of the farmers are smallholder farmers but remain without titles due to an ongoing legal battle. Average size of farm is one to two hectares.

Bgy. Banaban, Bayambang, Pangasinan has 1,634 population. Farming is the primary source of income with palay and corn as the main crops. Mungbean is also planted as a third crop but only when the farmers have capital.

Majority of the farmers are leaseholders and tenants. Only 5-10% own lands; 90% are farm workers, of which, 50% are either tenants or leaseholders. Farm workers are normally paid Php150 a day. Sharing system between the land owner and the tenants is normally 12 cavans to 20 cavans per cropping. The landlord-tenant relation is only implemented for palay cropping while during the second crop which is corn, the sharing system is not implemented. In some cases, tenants would pay 5 sacks of palay as rent and 20% of their total profit from planting corn at no cost to the landowner.

Secondary source of livelihood and income is rope-making, which is a household affair where all the household members are involved. Other sources of income are food vending like rice cakes, soya curd, and mini stalls of meat and vegetable.

Farmlands in Bgy, Banaban are not irrigated. Water is sourced from deep wells that every household has.

Bgy. Macayo-cayo of the Municipality of Bayambang in Pangasinan has seven sitios which are formerly haciendas owned by the Ulanday, Tupas and Angeles families.

Majority of the farmers are smallholders where average farm size is 5,000 square meters (sq.m) or 0.5 hectare. Most are title holders. Eighty percent of the farmers are agrarian reform beneficiaries (ARBs) while the rest acquired their lands through inheritance. About 30% are farm workers, while 70% of the total number of farmers own their lands.

Primary source of income is farming, notably rice and corn, intercropped with vegetables like legumes, tomatoes, ampalaya and eggplant. All households in the barangay have their own backyard livestock and poultry. Some 70% of the farmers work on rope making during lean months. Other sources of income are from food vending and managing sari-sari stores.

Bgy. San Nicolas, San Dionisio, Iloilo, has an area of 380-hectares with slightly sloping terrain. Farming is the primary source of income. The primary crop is corn and rice is secondary. Mungbean and other vegetables including root crops (camote and cassava) and tubers (peanuts) are also planted.

Other sources of livelihood is contractual work, such as construction work (Php150-200/day), stevedoring in quarries (Php200 per cubic meter), firewood gathering (Php8.00 per bundle), and charcoal making (Php100-130 per sack).

Majority (90%) are smallholder farmers while the rest are farm workers. About 10% of the smallholder farmers lease their lands. The average farm size is one to 1.5 hectares; 300 sq.m. is the smallest while the biggest is two hectares. Corn area covers some 55 hectares, rice

lands cover about 30 hectares, while lands classified as timberland cover more than 100 hectares. Majority of the farmers own their home lots.

Bgy. Quinabonglan in Maayon, Capiz covers 980 hectares of largely hilly agricultural lands. A total of 188 households reside in the Qionabonglan. It has five sitios, Cabanbanan, Mainoswagan, Mahidaiton, Agloy-a, Mabinoligon-Proper.

In Mabinoligon Proper, 90% of the farmers own the farms they till ranging from 1-3 hectares. The lands were awarded to them through CARP. The average farm size is 1 to 3 hectares with the majority owning 3 hectares, mostly titled and with Certificates of Land Ownership Award (CLOA). The rest are tenants and farm workers, as there are still families with 20 to 40 hectares landholdings. Sharing arrangements between tenant and landowner varies, such as harvest sharing (7 sacks tenant:1 sack landowner) or tenants pay the land owners Php1,500-2,000 per hectare.

Farming is the primary source of livelihood. About 98% in Sitio Proper plant corn while 50% plant rice. Vegetables, root crops and banana are planted for consumption and the surplus is for selling. Livestock and poultry are also raised. Small-scale mining is also a secondary source of livelihood.

Bgy. Carataya, Cuartero, Capiz covers 8,000 hectares, largely forest areas. It is 25 kilometers from the Poblacion in Cuartero. It comprises seven sitios, namely Carataya Proper, Dumalagan, Kinanat-Ulo, Implamon-an, Serapian, Agbulao, and Tambobo.

Total population is 1,313 with 315 households and 334 families. In Carataya Proper, there are at least 25 households.

Primary source of livelihood is farming, with corn as major source of income. All farmers plant corn mostly in the upland and hilly portions of Carataya that comprise 50% of Carataya's land area. Palay accounts for 20% of the land area and forest lands comprise about 10% while the rest comprise homelots and vacant cogonal areas.

Other crops planted are string beans, squash, coconut, and mahogany. Off-farm work are carpentry, as farmworkers, and as government employees. Farmers are also into livestock and poultry-raising – carabao, cattle, swine, goats, chicken, and ducks.

Only about 30% of the farmers own their farmlands while 70% are tenants. Farm workers comprise 15% of the total farming population. Smallholder farm lot in Cuartero is one hectare on the average – 3 hectares is the highest and the 1/8 hectare is the smallest.

About half of the total land area of Carataya or 4,000 hectares was previously owned by a certain Ed Abalo and distributed to the farmers under PD No. 27 and later on under the CARP.

Bgy. Bungsuan, Dumarao, Capiz occupies a total land area of 1,660.26 hectares, with a population of 4,282 or 10.05% of Dumarao's total population in 2007. It has 856 households and is about eight kilometers from the town proper. Bungsuan has eight sitios.

The main economic activity is farming and trading agricultural products. Vegetables and root crops from Bungsuan and nearby barangays of Agsirab Traciano, and San Juan are hauled for sale to Roxas City, Kalibo and Iloilo City. Production is year-round while harvesting and trading are done weekly.

Corn areas, according to the farmers, make up about 1,000 hectares. Lands owned by the landlords are usually planted to sugarcane. Vegetables are also widely cultivated.

The Bureau of Animal Industry animal stock farm, which comprises 585 hectares of Bungsuan, has 222 households and 95% are engaged in farming. The land awarded to the farmers in 1989 was the result of the farmers' occupation of the stock farm that was formerly owned by the BAI but only served as grazing lands for the rich families' cattle.

The average size of lands owned by the farmers within the stock farm is 1/8 hectare to 1.5 hectares. The farmers have not paid arrears to the Land Bank of the Philippines (LBP) because to this day the lands are yet to be measured and assessed by the bank. Neither has there been any tax declaration issued them by the Department of Agrarian Reform (DAR). Of the total 585 hectares supposed to be awarded the farmers, only 465 hectares were granted. According to the DAR, the BAI will develop 120 hectares of the stock farm as a university. There are also areas in other sitios covered by CARP. Meanwhile, there are still landlords occupying about 20 to 200 hectares.

Bgy. Halapitan, San Fernando, Bukidnon has a total land area of 6,162.10 hectares and composed of 14 sitios. Its main sitio, Sitio Poblacion, is further subdivided into 11 puroks. Total alienable and disposable lands comprise 1,501.12 hectares while forest lands cover 4,660.85 hectares. About 2,597 farmers till 1,200

hectares of forest lands. About 976 families are owner-operators of their farmlands while about 617 families are tenants.

Corn is planted to some 1,030 hectares while rice is planted to 540 hectares of land. Next to corn and rice, banana is also widely planted. Most of the agricultural products as well as farm inputs such as fertilizers, chemicals, certified seeds, farm implements, etc. are sold or brought to Sitio Poblacion, Valencia City and Cagayan de Oro City.

The Mayor of San Fernando and the family of a certain Mr. Ravago were identified by the farmers as owning large tracts of agricultural lands.

Bgy. Mindagat is one of the 11 barangays of ***Malitbog, Bukidnon,*** located at the northernmost part of Malitbog. It has a total land area of 1,745 hectares, 77% are alienable and disposable and the remaining are forest lands.

Its soil type is mountain soil undifferentiated and is suitable for high value perennial crops as well as rice and corn production. It is rich in minerals such as chromite and volcanic slabs.

About 1,408.23 hectares of Mindagat suffer from moderate erosion while 117.19 hectares is under severe erosion. Only 21 hectares are irrigated and planted to rice. Some 659 hectares are planted to corn, roots crops and upland rice.

Mindagat depends on cattle or carabao in plowing the field for crop production. About 29% or 118 households have access to draft animals for land preparation while the remaining 71% or 291 households use either the traditional tools or rent draft animals in the area. Livestock and poultry are raised by majority of the households.

Fifty percent of the total agricultural production is sold to the market. About 85% of farmers' produce is bought by traders and sold to major buyers and processors while 15% is sold to direct buyers such as households for consumption or sari-sari stores. Major marketing outlets for Mindagat are Cagayan de Oro City and Tagoloan while the minor marketing outlet is in Bgy. Poblacion, Malitbog, Bukidnon.

Bgy. Cinco, Banga, South Cotabato has a total land area of 2,413 hectares and one of the 22 barangays of Banga, South Cotabato, which is touted as the corn capital of the Philippines. One of the corn drying and milling facilities of the NABCOR is located in Bgy. Cinco.

The municipality of Banga is fertile. Banga sandy loam is the dominant soil type in the municipality, followed by Faraon clay and Matutum sandy loam. Due to the intrinsic qualities of the soil, such as chemical composition, biological contents and physical characteristics, majority of the land is suitable for agriculture, of which 45% is planted to corn that according to local government officials is GM corn. Rice is the secondary crop covering 32% of total agricultural land. Of the potential irrigable area, only 23.33% is irrigated.

There are five rice mills and eight multi-purpose drying facilities in Banga. White corn produced in Banga finds its way to a corn mill in General Santos City where it is milled into corn grits for human consumption. White corn and GM corn production in Banga is traded in Koronadal City; Polomolok, General Santos City; Davao City, and Cagayan de Oro City. Value of yellow corn production in 2010 was at Php886 million and white corn production at Php121 million. GM corn production was valued at Php102 million.

Primary crops are rice and corn, and banana and coconut are also widely planted. Banana contract farms by Dole Stanfilco are in Bgy. Cinco. Cassava and turnip and other fruits are also propagated. Corn farmers are also contracted as seed growers by agents of foreign seed companies, primarily Pioneer Hi-Bred and Evogene.

Bgy. South Sepaka, Bagumbayan, Sultan Kudarat comprises 8,164 hectares, most of which are forest lands and only about 119 hectares are rice and corn farms. Corn farms comprise 80% of total rice and corn areas. Sixty percent of the farmers plant corn. The rest plant rice although they also plant corn from time to time.

South Sepaka is formerly part of the municipality of Sto. Niño, South Cotabato. Geographically, it is closer to South Cotabato than it is to Sultan Kudarat. The bridge traversing Hala River serves as the boundary between Sto. Niño, South Cotabato and Bagumbayan, Sultan Kudarat.

Farmers also plant vegetables, such as string beans, legumes, cassava, squash, and eggplant. Banana growers are contracted by Dole Stanfilco who leases their lands for a period of 15 years.

Each of the farming families maintains at least 10 coconut trees for their own use. Vegetables are primarily planted for the household's consumption and traded only when there is surplus.

APPENDIX 3
Table 1: Summary of GM Corn Cost of Production, Major Items, Cash Basis

ITEMS	ISABELA		PANGASINAN		ILOILO	
	Villa Rey, Echague	Caquilingan, Cordon	Banaban, Bayambang	Macayo-cayo, Bayambang	San Nicolas, San Dionisio	Quinabonglan, Maayon (smallholder farmer)
Labor	12,950	10,500 - 11,700	16,800	4,575-5,700	5,240 - 5,440	7,885 - 8,455
Inputs						
Seeds	9,000	8,000	13,500 /a	9000	9,000	9,000
Fertilizers	9,960	10,200 - 10,800	14700	26,000 - 28,600	20,010-20,800	14,280
Herbicides	1,400	4,100	740	0	2,645-3,095 /c	1,920-2,200
Rent						
Land						
Dryer		150				426
Equipment plus Labor						
- Power spray		0 - 350				
- Tractor, baby tractor			5,400	4,000		
- Farm animal + labor	1,200	2,700	900	400 /b	600-900	1,200
- Thresher	2,000	3,300	1,800	1,092		
- Sheller					1,440 /d	2,400
Auxillary						
- Gasoline for irrigation			8,000	3,300 - 7,400		
- Gasoline for power spray		0- 60				
- Rice hull						400
- Diesel (krudo)						500
- Transportation cost				500		2,130 - 7,100
- Commission fees		1,000			2,875	
- Sack	1,000	3,000	3,600	2,775	1,800	1,400
- Twine		60				
- Food	5,600	6,890	5,400	1,600		1,400
TOTAL COST	43,110	49,900-52,110	70,840	53,242 - 62,667	43,610 - 45,350	42,941 - 48,761
TOTAL GROSS INCOME	38,850 (3,700kls * P10.50/kl) if dried kernels, 44,400 (100cavs * 52kls/ cav * P9/kilo) if on cobs	55,000 (100 cavs * 50kls * P11/kl)	90,000 (150 Cavs * 50kls * P12/kl)	65,520 (91 Cavs * 60kls * P12/kl)	37,500 (3,000kls * P12.50/kl)	42,600 (71 Cavs * 50kls * P12/kl)
TOTAL NET INCOME	(4260) - 8,840	2,890 - 5,100	19,160	2,853 - 12,278	(7,850) - (6,110)	(6,161) - (341)
NET INCOME RANGE*	(4,260) - 8,480	2,890 - 5,100	19,160	2,853 - 12,278	(7,850) - (6,110)	(6,280) - (341) /h

ITEMS	CAPIZ		BUKIDNON		SOUTH COTABATO	SULTAN KUDARAT
	Carataya, Cuartero (smallholder farmer)	Bungsuan, Dumarao	Halapitan, San Fernando	Mindagat, Malitbog	Cinco, Banga	South Sepaka
Labor	12,360-13,600	17,580 - 20,030	14,400-14,480	8,460 - 11,060	6,410 - 7,728	6,600
Inputs						
Seeds	8,400	8,600-9,100	7,400	7,000-8,000	3,800** - 8,000	7,900
Fertilizers	12,750	11,240	15,620	12,450	13,000	12,800
Herbicides	2,660-3,660 /e	3,300-4,500	3,000	1,800	2,380 - 2,580	1,950-2,100 /g
Rent						
Land						
Dryer			100	116		
Equipment plus Labor						
- Power spray	800			200 - 700		
- Tractor, baby tractor					3,200	1,200 - 1,600
- Farm animal + labor	1,000-1,200	1,200	1,000 - 2,000	1,440	600	1,800
- Thresher						
- Sheller	4,000	5,040	1,332	1,225-1,750		
Auxillary						
- Gasoline for irrigation						
- Gasoline for power spray						
- Rice hull						
- Diesel (krudo)						
- Transportation cost	3,360	1,670 - 1,720	1,739	6,650	675- 1080	750-1,500
- Commission fees						
- Sack	2,600	2,964		1,160		
- Twine		35				
- Food	600	4,200	860		700 - 1200	
TOTAL COST	48,530-50,970	57,349-61,549	45,451-46,531	40,501-45,126	30,765 - 37,388	33,000-34,300
TOTAL GROSS INCOME	60,000 (60 Cavs * 80kls * P12.50/kl)	63,840 (76 Cavs * 70kls * P12/kl)	59,400 (90 Cavs * 55kls * P12/kl)	35,000 (3,500kls * P10/kl)	37,908 (135 Cavs cobs * 54kls * P5.20/kl)	41,250 (150 Cavs * 55kls * P5/kl)
TOTAL NET INCOME	9,030 - 11,470	2,291-6,491 /f	12,869 - 13,949	(10,126) - (5,501)	520 - 7,143	6,950 - 8,250
NET INCOME RANGE*	9,030 - 11,470	2,291-6,491	12,869 - 13,949	(10,126) - 6299/i	(1,455.60) - 7,143/j	6,950 - 8,250

/a equivalent to three bags of seeds at 10 kilos each bag

/b at minimum cost when corn farmers do not have enough resources, they utilize cows and labor to prepare the corn farms

/c includes Php25 rodenticide, zinc phosphide

/d shelling and drying

/e includes pesticide Marshall at Php440

/f most times, the corn farmers borrow from financier-traders their consumption of rice for six months from land preparation to harvesting. Hence they net a negative balance of Php6,859-11,059 by harvest time

/g includes pesticide Solomon, Php750 for the corn hopper pest (CHP) or waya-waya

/h variance in income depends if farmer uses solar or mechanical dryer

/i income may increase if corn is sold at Php13/kilo; Php46,800 (3,600kls*P13/kl). Net income is Php1674 - Php6299

/j income may decrease if traders shave 5 - 7 kilos per sack. Gross income would be Php35,942.20. Net income would be (1445.60) - (297.60)

*Range of cost depending on land type,rent or other ranges in expenses. Computation tables are with the publisher.

** used 'ukay-ukay' or mixed seeds

Table 2: Summary of GM Corn Cost of Production, Major Items, Loan Basis

ITEMS	ISABELA		PANGASINAN		ILOILO
	Villa Rey, Echague	Caquilingan, Cordon	Banaban, Bayambang	Macayo-cayo, Bayambang	San Nicolas, San Dionisio
Labor	12,950	11,900 – 11,600	16,800	4,775-5,900	6,288 - 6,528
Inputs					
Seeds	10,500	10,000	15,000 /a	10,000 – 11,000	10,800
Fertilizers	13,100	12,900 – 13,500	15,750	33,000 - 39,600	24,012-24,960
Herbicides	1,600	5,200	740	0	3,174-3,714 /c
Rent					
Land					
Dryer		150			
Equipment plus Labor					
- Power spray		0 - 350			
- Tractor, baby tractor			5,400	4,000 – 6,000	
- Farm animal + labor	1,200	2,700	900	400 /b	720-1,080
- Thresher	2,000	3,300	1,800	1,092	
- Sheller					1,728 /d
Auxillary					
- Gasoline for irrigation			8,000	3,365 - 7,548	
- Gasoline for power spray		0- 60			
- Rice hull					
- Diesel (krudo)					
- Transportation cost				500	
- Commission fees		1,000			2,875
- Sack	1,000	3,000	3,600	2,775	2,160
- Twine		60			
- Food	5,600	6,890	5,400	1,600	
Interest on loan	10,470	5,500 – 5,740	8,320	9,273-11,629**	8,147-8,495** /e
Mark-up*	4,840	4,900 – 5,800	3,600	7,600-8,600	
TOTAL COST	58,420	62,600-63,550	81,710	61,507-76,015	51,757 - 53,845
TOTAL GROSS INCOME	38,850 (3,700kls * P10.50/kl) if dried kernels, 44,400 (100cavs * 52kls/cav * P9/kilo) if on cobs	55,000 (100 cavs * 50kls * P11/kl)	90,000 (150 Cavs * 50kls * P12/kl)	65,520 (91 Cavs * 60kls * P12/kl)	37,500 (3,000kls * P12.50/kl)
TOTAL NET INCOME	(19,570) - (6,830)	(8,550) - (7,600)	8,290	(10,495) - 4,013	(16,345) - (14,257)
NET INCOME RANGE*	(19,750) - (6,830)	(9,150) - (7,000)/i	8,110 - 8,290	(10,495) - 4,013	(16,345) - (14,257)

ITEMS	CAPIZ				
	Quinabonglan, Maayon (smallholder farmer)	Quinabonglang, Maayon (tenant)	Carataya, Cuartero (smallholder farmer)	Carataya, Cuartero (tenant)	Bungsuan, Dumarao
Labor	8,660 - 9,720.60	8,001.30 - 9,057.90	13,432-14,920	10,216 - 10,900	17,580 - 20,030
Inputs					
Seeds	11,160-11,880	11,160-11,880	10,320	10,320	10,440-12,420
Fertilizers	19,195.20 - 20,433.60	19,195.20 - 20,433.60	16,500	16,500	13,608-15,849
Herbicides	2,728-3,696	2,728-3,696	3,432-4,632 /f	3,432-4,632 /f	3,996-6,115.50
Rent					
Land		6,300		51,000***	
Dryer	528.24-562.32	475.56-487.08			1,520
Equipment plus Labor					
- Power spray			960	960	
- Tractor, baby tractor					
- Farm animal + labor	1,488-1,584	1,488-1,584	1,200-1,440	1,200-1,440	1,200
- Thresher					
- Sheller	2,400	2,400	4,000	714.2	5,040
Auxillary					
- Gasoline for irrigation					
- Gasoline for power spray					
- Rice hull	620-660	620-660			
- Diesel (krudo)	496-528	496-528			
- Transportation cost	2,641.20 - 9,372	1,845 - 6,150	4,032	806.4	1,670 - 1,720
- Commission fees					
- Sack	1,736-1,848	1,736-1,848	3,120	3,120	2,964
- Twine					35
- Food	1,736-1,848	1,736-1,848	720	720	4,200
Interest on loan	8,611.20-11,665.60**	9,061.56-12,266.08**	7,134-7,602**	5,992.40-6,326.40**	4,674-8,914.50**
Mark-up*	1,480-1,800	1,480-1,800	1,400	1,400	230-630
TOTAL COST	53,388.64 - 64,892.52	58,181.06 - 66,872.58	57,716-60,644	98,988.60 - 101,112.60	62,253-71,093.50
TOTAL GROSS INCOME	42,600 (71 Cavs * 50kls * P12/kl)	36,900 (61.5 Cavs * 50kls * P12/kl)	60,000 (60 Cavs * 80kls * P12.50/kl)	12,000 (12 Cavs * 80kls * P12.50/kl)	63,840 (76 Cavs * 70kls * P12/kl)
TOTAL NET INCOME	(22,293) - (10,788.64)	(29,972.58) - (21,281.06)	(644) - 2,284	(86,988.60) - (89,112.60)	(7,253.50) - 1,587 /g
NET INCOME RANGE*	(22,293) - (10,788.64)	(30,267.60) - (21,281.06) /j	(644) - 2,284	(86,988.60) - (89,112.60)	(7,253.50) - 1,587

ITEMS	BUKIDNON		SOUTH COTABATO	SULTAN KUDARAT
	Halapitan, San Fernando	Mindagat, Malitbog	Cinco, Banga	South Sepaka
Labor	17,184-18,259.2	11,124 - 13,804	6,580-7,896	6,600
Inputs				
Seeds	8,000 -10,000	9,800-11,200	8,800-9,600	9,845.60-10,348
Fertilizers	20,000-20,900	17,430	14,300-15,600	15,299.20 - 15,996
Herbicides	4,400	2,520	2,618-3,096	2,226-2,460 /h
Rent				
Land				
Dryer	100	116		
Equipment plus Labor				
- Power spray		280 - 980		
- Tractor, baby tractor			3,200-3,840	1,200 - 1,600
- Farm animal + labor	1,400 - 2,800	2,016	600-720	1,800
- Thresher				
- Sheller	1,332	1,225-1,750		
Auxillary				
- Gasoline for irrigation				
- Gasoline for power spray				
- Rice hull				
- Diesel (krudo)				
- Transportation cost	1,739	7,910	675 – 1,296	750-1,500
- Commission fees				
- Sack		1,160		
- Twine				
- Food	860		1,200-1,440	
Interest on loan	3,184 - 3,891**	13,080-13,760**	2,358-8,022**	4,440.8-5,584**
Mark-up*	2,870 - 4,010			120-180
TOTAL COST	55,015 - 60,390	53,581-58,886	37,973-43,488	37,720.8-40,304
TOTAL GROSS INCOME	59,400 (90 Cavs * 55kls * P12/kl)	35,000 (3,500kls * P10/kl)	37,908 (135 Cavs cobs * 54kls * P5.20/kl) minimum or 36,450 if trader shaves 0.20 cents from prevailing corn price/kl maximum	41,250 (150 Cavs cobs * 55kls * P5/kl)
TOTAL NET INCOME	(990) - 4,385	(23,886) - (18,581)	(7,038) - (65)	946 - 3,529.20
NET INCOME RANGE*	(990) - 4,385	(23,886) - (6,781) /k	(8,928) - (65)/l	946 - 3,529.20

/a equivalent to three bags of seeds at 10 kilos each bag

/b at minimum cost when corn farmers do not have enough resources, they utilize cows and labor to prepare the corn farms

/c includes Php30 rodenticide, zinc phosphide and Php84 for rice to mix with zinc phosphide

/d shelling and drying

/e computed with the cash loaned, no mark up on items

/f includes pesticide Marshall at Php552

/g most times, the corn farmers borrow from their financier-traders their consumption of rice for six months from land preparation to harvesting. When bought in cash, rice is Php1,500/sack but when loaned, Php700 is added. Hence corn farmers nets a negative balance of Php9,813-18,653.50 by harvest time

/h includes pesticide Solomon, Php750 for the corn hopper pest (CHP) or waya-waya

/i variance in income depends if the farm is irrigated, located in lowland or upland or uses manual or power spray

/j variance in income depends if farmer uses solar or mechanical dryer

/k income may increase if corn is sold at Php13/kilo; Php46,800 (3,600kls*P13/kl). Net income is (Php6781) - (Php12,086)

/l income may decrease if traders shaves 0.20 cents from prevailing price of corn. Add to this the 5 - 7 kilos less per sack. Gross income would be Php34,560. Net income would be (8,928)

*mark-up already included in the price, shown only to reveal mark-up value

**interest on loan already included in the computation

***landlord gets 144 sacks of corn in cobs from harvest, which translates to 51 sacks if shelled and dried (51 sacks*80kls/sack*Php12,50/kilo)

****Range of cost depending on rate of interest, land type,rent or other ranges in expenses. Computation tables are with the publisher.

APPENDIX 4a
Cost of Production of GM Corn per Hectare Barangay Bungsuan, Dumarao, Capiz; Cash Basis (in pesos)

	ACTIVITY	UNIT	PARTICULARS	UNIT COST		QUANTITY	CASH	
				Min	Max		Min	Max
1	Spray of Herbicides	Gallon	Shine/RR	1,100.00	1,500.00	2 gallons	2,200.00	3,000.00
		Sprayer	Labor	25.00		18-40 tanks	450.00	1,000.00
2	Land preparation (Idas/Tudling)	Carabao + Farmer	Labor + Animal	200.00		2 carabaos * Php200 * 3 days	1,200.00	1,200.00
	Food		Food	50.00		Php300.00*2 days	600.00	600.00
3	Planting (Panggas)	Farmer	Labor	100.00		10pax * Php100 * 4days	4,000.00	4,000.00
	Food		Food	300.00		300*4days	1,200.00	1,200.00
	Binhi	Bags	RR/YR	4,300.00	4,550.00	2 bags	8,600.00	9,100.00
After 14 days								
4	Side & Top Dress	Bags	14-14-14	1,200.00		6 bags	7,200.00	7,200.00
			Urea	1,300.00		2 bags	2,600.00	2,600.00
			Sulpato	720.00		2 bags	1,440.00	1,440.00
	Labor	Farmer	Labor	100.00		5pax * 2days * 100 * 2 dresses	2,000.00	2,000.00
	Food		Food	150.00		150 * 2days * 2 dresses	600.00	600.00
	Transportation		Transportation	15.00	20.00	10 bags	150.00	200.00
5	Spray Herbicide	Gallon	Shine/RR	1,100.00	1,500.00	1 gallon	1,100.00	1,500.00
	Labor	Sprayer	Labor	25.00		30 sprayers * 25	750.00	750.00
60 days after 2nd spray, 115-117 days after planting								
6	HARVEST							
	Sako		Pieces	13.00		228 sacks, corn cobs	2,964.00	2,964.00
	Straw Lace		Straw Lace	35.00			35.00	35.00
	Harvesters (pitas)	Total corn cob yield		228 sacks				
		Shared by harvester (nagpitas)	11:1 sharing	21 sacks from 228		Of the 21 sacks corn cobs, it will be reduced to 11 sacks dried kernels. 11 sacks*70kl/sack*Php12.00/kl	9,240.00	9,240.00
	Manual Shelling (padpad)	Sacks before shelling corn cobs	228 – 21 (from harvester)	207 sacks				
		Sacks after shelling, corn grains		109.51 sacks				
		Shared by sheller (nagpadpad)	10:1 sharing	11 sacks			5,040.00	5,040.00
	Food			60.00		10 pax*3days*60	1,800.00	1,800.00
	Drying	Sacks before drying		98.51 sacks				
		Sacks after drying		76 sacks				
		Rent for the drying facility		20.00/sack		20.00 * 76 sacks	1,520.00	1,520.00
	Hauling		Labor	15.00	40.00	* 76 sacks	1,140.00	3,040.00
	Trucking		transportation	20.00		20 * 76 sacks	1,520.00	1,520.00
	TOTAL GROSS YIELD	76 sacks shelled and dried corn * 70kls/sack	5,320 kilos					
	TOTAL GROSS INCOME	5,320 kilos * 12/kilo	Php63,840.00					
	TOTAL COST						57,349.00	61,549.00
	TOTAL NET INCOME/LOSS						6,491.00	2,291.00

APPENDIX 4b
Cost of Production of GM Corn per Hectare Barangay Bungsuan, Dumarao, Capiz; Loan Basis (in pesos)

	ACTIVITY	PARTICULARS	CASH		Mark-up upon loan		Loan			Mark-up		Interest amount		
			Min	Max	Min	Max	Min (1) 5%*4mos = 20%	Min (2) 5%*5mos = 25%	Max 7%*5mos = 35%	Min	Max	20%	25%	35%
1	Spray of Herbicides	Shine/RR	2,200	3,000	2,220	3,020	2,664	2,775	4,077	20	20	440	555	1,057
		Labor	450	1,000			450	450	1,000					
2	Land preparation	Labor + Animal	1,200	1,200			1,200	1,200	1,200					
	Food	Food	600	600			600	600	600					
3	Planting	Labor	4,000	4,000			4,000	4,000	4,000					
	Food	Food	1,200	1,200			1,200	1,200	1,200					
	Binhi	RR/YR	8,600	9,100	8,700	9,200	10,440	10,875	12,420	100	100	1,740	2,175	3,220
After 14 days														
4	Side & Top Dress	14-14-14	7,200	7,200	7,260	7,500	8,712	9,075	10,125	60	300	1,452	1,815	2,625
		Urea	2,600	2,600	2,620	2,700	3,144	3,275	3,645	20	100	524	655	945
		Sulpato	1,440	1,440	1,460	1,540	1,752	1,825	2,079	20	100	292	365	539
	Labor	Labor	2,000	2,000			2,000	2,000	2,000					
	Food	Food	600	600			600	600	600					
	Transportation	Transportation	150	200			150	150	200					
5	Spray Herbicide	Shine/RR	1,100	1,500	1,110	1,510	1,332	1,387.50	2,038.50	10	10	222	277.50	528.50
	Labor	Labor	750	750			750	750	750					
60 days after 2nd spray, 115-117 days after planting														
6	HARVEST													
	Sako	Pieces	2,964	2,964			2,964	2,964	2,964					
	Straw Lace	Straw Lace	35	35			35	35	35					
	Harvesters	228 sacks												
		11:1 sharing (21 sacks)	9,240	9,240			9,240	9,240	9,240					
	Manual Shelling	228 – 21 (from harvester) = 207 sacks												
		109.51 sacks shelled grains												
		10:1 sharing = 11 sacks	5,040	5,040			5,040	5,040	5,040					
	Food		1,800	1,800			1,800	1,800	1,800					
	Drying	98.51 sacks												
		76 sacks												
			1,520	1,520			1,520	1,520	1,520					
	Hauling	Labor	1,140	3,040			1,140	1,140	3,040					
	Trucking	transportation	1,520	1,520			1,520	1,520	1,520					
	TOTAL GROSS INCOME	5,320 kilos * 12/kilo	63,840											
	TOTAL COST						62,253	63,421.50	71,093.50	230	630	4,674	5,842.50	8,914.50
	TOTAL NET INCOME/LOSS						1,587	418.50	(7,253.50)			7.47%*	9.21%*	12.53%*

*percent share of interest to total cost of production

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