Organic farming and Co-existence with GMOs and Applications of GM technology in Provinces of Bohol and Negros Occidental

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Topics
  Organic agriculture policies
  GM crop policies
  GM crops for Philippine agriculture
  Co-existence of organic agriculture and GMOs
RA 10068 - Organic Agriculture Act 2010
RA 11511 – Amendments to RA 10068

Organic agriculture - all agricultural systems that promote the ecologically sound, socially acceptable, economically viable and technically feasible production of food and fibers.

Organic agriculture dramatically reduces external inputs; refrains from using chemical fertilizers, pesticides and pharmaceuticals. Covers areas such as, but not limited to, soil fertility management, varietal breeding and selection under chemical and pesticide-free conditions, use of biotechnology and other cultural practices consistent with the principles & policies of this Act, & enhance productivity without destroying the soil & harming farmers, consumers & the environment (IFOAM): Provided, That the biotechnology herein referred to shall not include genetically modified organisms or GMOs.
Organic agriculture is regulated through certification that production system standards have been met.

RA 11511 – Amendments to RA 10068 provided for two types of certification:

- Participatory guarantee system (PGS) – a locally focused quality assurance system developed and practiced by people engaged in organic farming; built on a foundation of trust, social network & knowledge exchange; used to certify farmers and producers; products to be traded only locally unless there is established a mutual recognition agreement.

- Third-party certification - defined as when the firm requires that its supplies meet a certain standard and requests an independent organization that is not involved in the business relationship to control the compliance of the suppliers. ~ 2,000 has certified organic (BAFPS, 2020)

RA11511 - Provided for organic production zones.

Minimum standards for

(a) conversion;
(b) crop production;
(c) animal production;
(d) beekeeping;
(e) processing;
(f) special products;
(g) labeling and consumer information;
(h) traceability; and

(i) requirements for the inclusion of substances for organic production

Standards and certification processes conforms with IFOAM standards and procedures
GMOs or genetically modified organisms regulated per EO514 ser 2006

"Genetically modified organism” [EO514 ser 2006] - also refers to “living modified organism” under the Cartagena Protocol on Biosafety and refers to any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology

Modern biotechnology - the application of:

a. In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and 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 used in traditional breeding and selection
GM crops regulated per JDC 1 ser 2022
Regulation based on food and environmental safety assessments

Safety assessments conform with standards set by international bodies
Regulatory differences:

Organic agriculture – production system regulated, farm level

GMOs – specific product regulation, once approved, can be planted where crop is allowed or used to be planted

Organic agriculture – regulated to ensure production standards are met

GM crops – regulated to ensure food and environmental safety of specific product

US food recalls

  Recall of organic foods – deaths and illnesses due to bacterial contamination

  Recall of biotech events – regulatory non-compliance
## Rates of adoption (2017)

<table>
<thead>
<tr>
<th></th>
<th>GM crop farming</th>
<th>Organic agriculture</th>
</tr>
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<tbody>
<tr>
<td>Year introduced</td>
<td>1996</td>
<td>1920</td>
</tr>
<tr>
<td>No of hectares planted</td>
<td>189.8 million hectares</td>
<td>70 million hectares planted</td>
</tr>
<tr>
<td>No of countries planting</td>
<td>24 countries</td>
<td>181 countries</td>
</tr>
<tr>
<td>No. of farmers planting</td>
<td>17 million farmers</td>
<td>2.9 million organic producers</td>
</tr>
<tr>
<td>Intellectual property protection</td>
<td>Yes</td>
<td>none</td>
</tr>
<tr>
<td>Number of crops planted</td>
<td>17</td>
<td>many</td>
</tr>
<tr>
<td>Mode of spread of technology</td>
<td>by large multinational corporations (4) Worldwide, farmer to farmer</td>
<td>by individuals, small groups, supported by consumers with similar philosophies, NGOs, currently promoted by FAO and governments ( RA 10068, RA 11511 PHL)</td>
</tr>
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GMOs in Philippine agriculture

GM corn – Insect resistant, herbicide tolerant (Bt/RR Corn)
- 500 - 800,000 has/yr, yields - 4-17 tons/ha
  Aug 2019 – July 2020 – 805,309
  Aug 2020-July 2021 – 506,439
- Main ingredient in feeds

GM rice – pro-vitamin A in grain,

Imported GM soybean in feeds and food

Enzyme in feeds produced by GM microbes

GM sugarcane in other countries
- Drought tolerant sugarcane – Indonesia (pilot scale)
- Stem borer resistant sugarcane (Bt sugarcane) – Brazil (commercial)

Other traits being transferred – disease resistance (virus, bacteria, fungus)
- herbicide tolerance, industrial traits to increase saccharification efficiency,
- production of bioplastics (Budeguer et al 2021)
DA target for organic agriculture conversion – 5.0% of agriculture area
95% for non-organic, includes GM corn areas
As of today, third party certified organic areas < 2,000 has of 9.67 Million has of PHL agricultural land
Some challenges to adoption of organic farming –
Certification – addressed by RA 11511
Conversion – required 2 years incurs loss in income
Farm level certification
Lower yields hence the need for niche marketing to attain higher incomes
GM corn –
Approved for commercial planting in 2002
Since 2010 range in area planted per year - 500-800,000 hectares
Planted in all regions except Reg VII
Planted by >400,000 small farmers

Why the high rate of adoption? – GM corn farmers have increased yields and incomes
~ P6 Billion /year additional incomes (DA, 2014)

How much increase in yield?
Compared with OPVs - >100%
Compared with non-GM hybrids - ~20%

How much increase in income?
Less cost due to less use of pesticide, less labor, increased yields
Depends on farm gate price – net P100,000 ++/ha per season
Productivity growth of corn industry increased by 11.45% due to GM corn adoption
Corn imports decreased by 5.4%
Benefits from GM corn accrue to all planters – small-holders, large landholdings

Impact on environment –
GM crops promotes arthropod biodiversity – Reyes, 2002 PHL
GM crops (herbicide tolerant crops) allows farm plant biodiversity – BPI (Continuing monitoring)
GM crops do not become invasive – Crawley et al 2001 EU

Impact on human health -
Farmers – healthier, less exposed to farm chemicals
Consumers – same as with non-GM foods
Other environmental impacts of GM crops in the Philippines (Gonzales, 2014)

Land use efficiency – 15% less land to produce 1MT w/ GM corn compared with non-GM corn: prevents conversion of virgin land to agriculture

Fertilizer use efficiency – GM corn farmers 9% more efficient than non-GM corn farmers: reduce carbon emission

Labor use efficiency – GM corn farmers more efficient by 26% than non-GM corn farmers

Pesticide use efficiency – 54% less pesticide use w/ GM corn compared with non-GM corn
Co-existence – respects the right of farmers to choose their production system as provided for in AFMA RA 11511 – provides for the establishment of organic farming zones

Co-existence means practicing in the same general area, town or province both organic agriculture and GM crop production by designating certain areas as exclusive organic agriculture areas in collaboration with farm owners.
Organic banana, coconut, GM rice co-existence
Co-existence –
Risk: Possible cross pollination between GM variety and non-GM variety of the same species in organic farms

Cross pollination only within the same species or closely related species

Depends on distance between farms, species (cross-pollinated vs. self-pollinated), use of common harvesting and post-harvest equipment and level of intrusion
Strategies to prevent cross pollination between GM crop and non-GM variety in organic farms

Adopt measures used for producing foundation/breeders/registered seeds

1. Planting at different times
2. Planting a tall, thick hedge between the two fields
3. Use nets to prevent insect pollinators
4. Planting away from each other: Planting distance
   ~ 200-500 meters for cross pollinating species
   ~10 meters for self- pollinating species
Hedge row protection from cross pollination
Netting to prevent cross pollination
Co-existence - major GM crop producers, also major organic food producers (2009)

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<thead>
<tr>
<th>Producer</th>
<th>GM crops (has)</th>
<th>Organic agriculture (has)</th>
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<tbody>
<tr>
<td>Argentina</td>
<td>21.3 million</td>
<td>4 million</td>
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<tr>
<td>Australia</td>
<td>200,000</td>
<td>12 million</td>
</tr>
<tr>
<td>Brazil</td>
<td>21.4 million</td>
<td>1.8 million</td>
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<tr>
<td>Canada</td>
<td>8.2 million</td>
<td>628,556</td>
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<tr>
<td>China</td>
<td>3.7 million</td>
<td>1.8 million</td>
</tr>
<tr>
<td>India</td>
<td>8.4 million</td>
<td>1.0 million</td>
</tr>
<tr>
<td>Mexico</td>
<td>100,000</td>
<td>332,485</td>
</tr>
<tr>
<td>USA</td>
<td>64 M</td>
<td>1.9 million</td>
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<tr>
<td>Uruguay</td>
<td>800,000</td>
<td>930,965</td>
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Thank you for your kind attention