Evaluation of the Economic Impacts of the GM Foods Labeling System in Taiwan

Outlines

- GM foods labeling system in Taiwan
- Evaluate the economic impacts of GM foods labeling system in Taiwan
- Limitation
- Suggestions

Taiwan GM foods labeling system

2001
- Soybeans, maize
- Packaged Foods

2014
- Whole Items
- Packaged Foods

2015.7
- Whole Items
- Packaged foods, Bulk foods, Food additive

Unintentional Presence Threshold

2001: 5% (Same as Japan)

2015.7: 3% (Same as Korea)

According to the results of the implementation, the supporting measures of tracking and inspection systems, and raw material supply situation, assess in every aspect and decide whether to continuously revise down to 0.9%.

Unintentional presence threshold: The ratio of contamination of GM raw materials due to harvest, storage, or other factors

The Impact of Unintentional Presence Threshold on Food Supply Chain

| Cost of Supply Chain Increases → Transfer to Customers? |
| Government Subsidies? |

Source: Ministry of Health and Welfare
Unintentional Presence Threshold

- Unintentional presence threshold: The ratio of contamination of genetically modified raw materials (Conformed to Food Safety Assessment) due to harvest, storage, or other factors.

Standards of Product Categories

- Labeled according to food categories, not related to food safety.
- E.g. Non-fat milk*: Milk Fat Contents <0.5% (m/m)

Standard of Safety Tolerance

- E.g. Food additives, harmful to human, should set up standard of safety tolerance.
- E.g. The tolerance of color fixative, nitrite, is less than 0.07 g/kg.

Source: Bureau of Standards, Metrology & Inspection, M.E.E.A., ROC, Ministry of Health and Welfare; Taiwan Institute of Economic Research analyzed.

Research about increased cost due to unintentional presence threshold

<table>
<thead>
<tr>
<th>Results</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research from Japan (threshold 5%), Europe (threshold 0.9%) and other countries stated that food price increased 6% – 12%</td>
<td>Northbridge (2012)</td>
</tr>
<tr>
<td>In New York State, U.S.A., if the threshold is 0.9%, each household expenditure will increase 48<del>1,556 USD, and annual total increase will be 0.2</del>7.6 billion USD due to the increased cost of foods.</td>
<td>Cornell University (2014)</td>
</tr>
<tr>
<td>In California, U.S.A., if the threshold is 0.95%, each household expenditure will increase 123<del>572 USD, and annual total increase will be 1.6</del>7.4 billion USD due to the increased cost of foods.</td>
<td>Northbridge (2012)</td>
</tr>
<tr>
<td>The supply cost of maize seeds at 0.5% of genetic engineering threshold will increase three times more than at the 1% threshold. Food cost will increase exponentially with decreasing threshold.</td>
<td>Kalaitzandonakes et al. (2007)</td>
</tr>
<tr>
<td>Revising threshold from 5% down to 0.5% proves that the cost of non-GM will be increased from 1.45 to 4.25 cents/bushel, increasing nearly 2 times of cost.</td>
<td>(Wilson et al., 2002)</td>
</tr>
</tbody>
</table>

Source: Taiwan Institute of Economic Research collated.

The impact of revising down unintentional presence threshold on consuming

Taiwanese Consumer Perception on the Health Risk of Genetically Modified Food Products to Human Beings

- Consumer concerns
  - A joint statement issued by the World Health Organization (WHO), the United Nations World Food Programme (WFP) and the Food and Agriculture Organization of the United Nations (FAO): There is no credible evidence that GM foods currently existing on the market would cause any harm to human body.
  - University of California (UC Davis): The animals fed with GM feeds are found to be as healthy as ordinary animals. <Journal of Animal Science, 2014 Oct.>

Evaluate the economic impacts of GM foods labeling system in Taiwan

- Organic Raw Materials
- Non-GM Raw Materials

- Experience from Japan and Europe: food manufacturers often choose organic or non-GM raw materials to replace GM raw materials to avoid GM warning labels causing panic.

Kalaitzandonakes et al. (2007)
Wilson et al., 2002
Northbridge (2012)
The model of evaluation

Economic Impacts

The conditions of organic/non-GM substituting GM ingredients

Substitution rate of GM ingredients at 50%
Substitution rate of GM ingredients at 100%

Situations of Revising Down Unintentional Presence Threshold

From 5% down to 3%
From 3% down to 0.9%

Main GM raw materials in Taiwan are soybeans and maize

Current Approvals of Genetically Modified Foods in Taiwan

Types: Approvals: Items

Single trait: Soybean: 15
Herbicide tolerant GM soybean
Insect-resistant GM soybean
Low saturated fat and high oleic acid GM soybean
Stearidonic acid GM soybean

Maize: 18
Herbicide tolerant GM maize
Insect-resistant GM maize
Lysozyme GM maize
Drought tolerant GM maize

Cotton: 6
Insect-resistant GM cotton
Herbicide tolerant GM cotton
Insect-resistant and herbicide tolerant GM cotton

Oilseed rape: 2
Herbicide tolerant oilseed rape

Stacked trait: Soybean: 5
Stacked type insect-resistant and herbicide tolerant GM soybean
Low saturated fat, high oleic acid and herbicide tolerant GM soybean

Maize: 42
Stacked type insect-resistant and herbicide tolerant GM maize
Stacked type multi-herbicide tolerant GM maize
Stacked type drought tolerant, insect-resistant and herbicide tolerant GM maize

The percentage of soybeans and maize among the entire raw materials

Soybean 4.92% Maize 0.66%

Soybean 4.26% Maize 0.66%

Percentage accounted for by GM soybean and maize on these ingredients

GM soybeans/maizes are 90% of that material

GM soybean 93%
GM maize 90%

Source: Legislative Yuan
Percentage accounted for by GM soybean and maize on these ingredients (continued)

Recent import quantity status of GM ingredients (Unit: tons)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>158,629</td>
<td>233,331</td>
<td>298,982</td>
<td>117,165</td>
<td>226,826</td>
<td>1,094,873</td>
<td>98.15%</td>
</tr>
<tr>
<td></td>
<td>1,865</td>
<td>4,609</td>
<td>4,749</td>
<td>3,146</td>
<td>6,277</td>
<td>20,634</td>
<td>1.85%</td>
</tr>
<tr>
<td>Maize</td>
<td>15,379</td>
<td>20,749</td>
<td>18,149</td>
<td>26,562</td>
<td>71,852</td>
<td>151,071</td>
<td>97.44%</td>
</tr>
<tr>
<td></td>
<td>369</td>
<td>409</td>
<td>1,528</td>
<td>571</td>
<td>1,094</td>
<td>3,971</td>
<td>2.59%</td>
</tr>
<tr>
<td>Feed</td>
<td>477,010</td>
<td>196,953</td>
<td>520,477</td>
<td>224,501</td>
<td>278,097</td>
<td>1,569,308</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: The CCC Code adopted by import and export statistics: 1201900091 (other GM soybeans, whether or not broken), 1201900092 (other non-GM soybeans, whether or not broken), 1005900091 (other GM maize), 1005900092 (other non-GM maize) and 1005900010 (feed maize).

Note 2: The percentage of GM maize feed was not included in feed maize.

Source: Customs Administration import and export magnetic tape data; prepared by Taiwan Institute of Economic Research.

Premium of Organic/Non-GM Raw Materials

- The reasons for the relatively cheap prices of GM ingredients are due to their high yield development goal, and less uses of pesticides and fertilizers resulting in lower production costs. Whereas, the planting costs and supply chain management of non-GM crops (including organic crops) are much higher than GM crops. Hence, the prices of non-GM ingredients are higher.

Premium of imported non-GM/organic soybeans in Taiwan

Note: *Premium of non-GM/organic= \( \frac{[\text{Soybean American non-GM/organic Jobber price}] - [\text{Soybean Selected Taipei Jobber price}]}{[\text{Soybean Selected Taipei Jobber price}]} \times 100\% \) * 
**Premium of non-GM/organic= \( \frac{[\text{Soybean American non-GM/organic Jobber price}] - [\text{Soybean Mixed Bulk at the port Jobber price}]}{[\text{Soybean Mixed Bulk at the port Jobber price}]} \times 100\% \) **

Source: InfoTimes financial database; Taiwan Institute of Economic Research analyzed

Premium of Organic Raw Materials

- Premium of organic soybeans and maize is estimated at least 100%~160%

<table>
<thead>
<tr>
<th>Item</th>
<th>Import Unit Price</th>
<th>Premium Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>14.62</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>24.59</td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>6.78</td>
<td>121%</td>
</tr>
<tr>
<td></td>
<td>14.99</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: The CCC Code adopted by import and export statistics: 1201900091 (other GM soybeans, whether or not broken), 1201900092 (other non-GM soybeans, whether or not broken), 1005900091 (other GM maize), 1005900092 (other non-GM maize) and 1005900010 (feed maize).

Note 2: The percentage of GM maize feed was not included in feed maize.

Source: Customs Administration import and export magnetic tape data; prepared by Taiwan Institute of Economic Research.
### Premium of Non-GM Raw Materials

- Premium of non-GM soybean and maize is estimated at least 23%~43%

<table>
<thead>
<tr>
<th>Premium of non-GM raw materials</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported packaged non-GM soybeans is 30 NTD/kg, and selected bean is 21 NTD/kg. Premium of non-GM is 42.9%</td>
<td>Central Union Oil Corp. (2013)</td>
</tr>
<tr>
<td>Imported non-GM soybeans is 32 NTD/kg, and GM soybean is 23 NTD/kg. Premium of non-GM is 40%</td>
<td>Tofu Business Association (2014.6)</td>
</tr>
<tr>
<td>In 2013, non-GM soybeans is 780 USD/mt. Comparatively, general soybean (selected bean, including GM soybean) is 635 USD/mt. Premium of non-GM soybean over GM soybean is 22.8%</td>
<td>Taiwan Sugar Corp. (2013.10)</td>
</tr>
<tr>
<td>Premium of forward price of non-GM soybeans is at the increasing trend. Premium in 2000 is 1000 or 2000 yen/mt, and increases to 5000 or 6000 yen/mt. Premium increases from 5% to 20%.</td>
<td>Tokyo Grain Exchange (2012)</td>
</tr>
</tbody>
</table>

Source: Taiwan Institute of Economics Research collated

### Ingredient Substitution

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Soybean</th>
<th>Maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic ingredients</td>
<td>Substitution rate at 50%</td>
<td>103%~164%</td>
</tr>
<tr>
<td></td>
<td>Substitution rate at 100%</td>
<td>105%~167%</td>
</tr>
<tr>
<td>Non-GM ingredients</td>
<td>Substitution rate at 50%</td>
<td>25%~45%</td>
</tr>
<tr>
<td></td>
<td>Substitution rate at 100%</td>
<td>27%~48%</td>
</tr>
</tbody>
</table>

Source: Estimated by Taiwan Institute of Economics Research

### Impact of Revising Down Unintentional Presence Threshold on Food Expenditure

- Food expenditure increases to 5% if the threshold is revised down from 3% to 5%.
- Food expenditure increases to 3% if the threshold is revised down from 0.9% to 0.9%.

<table>
<thead>
<tr>
<th>Impact of Revising Down Unintentional Presence Threshold on Food Expenditure</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research from Japan (threshold 5%), Europe (threshold 0.9%)and other countries stated that food price increased 6% ~ 12%</td>
<td>Northbridge (2012)</td>
</tr>
<tr>
<td>The supply cost of maize seeds at 0.5% of genetic engineering threshold will increase three times more than at the 1% threshold. Food cost will increase exponentially with decreasing threshold.</td>
<td>Kalaitzandonakes et al. (2007)</td>
</tr>
</tbody>
</table>

Source: Taiwan Institute of Economics Research

### Evaluated Results of Economic Impact

- Every household's annual food expenditure: NTD 110,918
- Average size of family: 3.23 people
- Total population: 23,373,517
- Weight of foods in Consumer Price Index (CPI): 14.53%

<table>
<thead>
<tr>
<th>Impact of the Taiwanese GM food labeling system on consumer food spending (unit: NT dollar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintentional Presence Threshold rate</td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Reduction from 3% to 5%</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Reduction from 0.9% to 0.9%</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Note 1: A survey on household incomes and expenses of foods as categorized by the Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Ministry of Interior, Taiwan Institute of Economics Research analyzed

Note 2: For the study, was restricted by information sources and time, the following factors were not taken into consideration: The inspection costs of industry owners, the government's management/execution and inspection/monitoring costs, isolation transportation and warehousing costs, and GM food products other than soybeans and maize.

Source: Estimated by Taiwan Institute of Economics Research
**Limitations**

Due to some limitations, such as sources and limited time, this research may underestimate the impact of revising down unintentional presence threshold of GM foods on food cost.

- Examination cost of industries
- Management, implementation and inspection cost of the government
- Isolated transit cost
- Isolated storage cost
- GM foods items except for soybean and maize

Inspection fee of every series of GM food is about NTD 6,000~28,000.
(Source: Food Industry Research and Development Institute, SGS Taiwan Inspection Technology Corp. Inquiry date: 2014/8/15)

**Suggestions**

- Revising down the unintentional presence threshold of GM foods should be careful to avoid an increase in consumer food expenditure.
- GM foods on the market should pass safety assessment, and emphasize “With the same food safety and risk as non-GM foods.”
- Use “Unintentional Presence Threshold” to replace “Tolerance” in order to avoid public misperception that the GM foods have safety concern.
- Promoting “non-GM foods” labeling lets premiums (spreads) be able to truly react food quality and costs.

**Thank you for your attention!**

Taiwan Institute of Economic Research
http://www.tier.org.tw
Email: d17664@tier.org.tw
TEL: (02)2586-5000
FAX: (02)2597-9641