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Agricultural Biotechnology Annual

Biotech Annual

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Report Highlights:
The U.S. has maintained its status as the top supplier of feed grains to Korea since 2014. While several proposals to expand biotech labeling are still pending in the National Assembly, MFDS announced its plan in early 2015 to expand mandatory biotech labeling to include all products with detectable biotech ingredients. MFDS will revise the current labeling standards in 2015. MFDS has not released details of the revision. The National Institute of Ecology has replaced the National Institute of Environmental Research as the agency responsible for assessing risk to the natural ecosystem.

Section I. Executive Summary:

Korea is heavily dependent on imported food (except rice) and feed grains. Only a limited number of food products are made from biotech ingredients due to negative consumer sentiment towards biotechnology, whereas the bulk of livestock feed is made from biotech corn and soybean meal. Typically the United States is the top grain exporter to Korea but 2013 was an exception as supplies were very limited following the severe drought in the United States in 2012. The United States regained its status as the top supplier to Korea in 2014 and 2015.

Imports of biotech grains as well as genetically engineered animals are regulated under the Living Modified Organism (LMO) Act. In December 2012 the Ministry of Trade, Industry and Energy (MOTIE) announced its first revision to the LMO Act, revising implementing regulations, and providing a definition of stacked events. Despite the revisions the regulations still do not make the fundamental distinction between biotech for food, feed and processing (FFP) and biotech seed, do not eliminate the redundant risk assessment process, and do not provide a workable definition of adventitious presence. MOTIE also revised the Enforcement Decree, the Enforcement Regulations, and the Consolidated Notice in 2014. Despite a few positive changes in the revised implementing regulations, concerns about redundancies in the consultation review process or excessive data requirements have not been fully addressed.

The Ministry of Food & Drug Safety (MFDS)'s earlier proposal published in 2008 and three additional draft bills submitted by lawmakers to the National Assembly in 2013 to expand biotech labeling to non-detectable products are still pending due to concerns registered by the domestic food industry. In early 2015, MFDS announced its plan to expand biotech labeling to include any food products containing detectable biotech ingredients. Under the current system, biotech labeling is not required for products that contain biotech ingredients beyond the top five ingredients. MFDS introduced this plan following extreme pressure from vocal NGOs demanding mandatory biotech labeling for all food products made with biotech ingredients (both detectable and non-detectable products), MFDS has not released further details of the plan. The domestic industry continues to register its concern over expanded labeling as it would end up misleading consumers, limit the available selection of products on the market, and increase production costs. The food industry continues to put pressure on MFDS to withdraw the plan to expand labeling.

While sensitivities remain with biotech food, consumers are much more comfortable with non-agriculture uses, such as pharmaceutical treatments. Generating local farmers' support in adopting and actively use this technology will be key to increasing consumer confidence in biotech food and livestock products.

In May 2015, the Rural Development Administration (RDA) released the results of the first phase for the Next Generation Bio-Green 21 Project, which aims to develop fundamental technology and commercialize such technology. With a total investment of 271.4 billion won (approximately $236 million) RDA decoded genomes for 9 items including pepper and ginseng and developed anthracnose

resistant pepper and other products between 2011 and 2014. RDA will invest another 300 billion won (approximately $260 million) by 2020 in order to commercialize the technology that has been and will be developed.

The Science Technology Basic Plan announced by the Ministry of Science, Information Communication Technology (ICT) and Future Planning (MSIP) in July 2013 will continue until 2017. The Korean government will invest 9.2 trillion won (approximately $8 billion) in science technology R&D for five years. MSIP has designated 30 focused technologies and genetic resource technology to develop and commercialize value added life science resources. The Ministry of Agriculture, Food, and Rural Affairs (MAFRA) also announced long and mid-term plans to promote agriculture technology. In the plan, the technology to develop bio materials and transformed animals for producing pharmaceutical products has been designated as one of the sub-projects to be carried out under the four major research areas that MAFRA will focus on.

In 2014, MAFRA plans to invest a total of $893 million for R&D, which is a 5.9% increase from the previous year in order to improve competitiveness and create a new future economic growth engine. Following MAFRA's long and mid-term plan to promote agriculture technology announced in 2013, MAFRA's investment will focus on four major areas; 1) strengthening global competitiveness, 2) creating a new growth engine, 3) ensuring a stable supply of food grain, and 4) improving public happiness. To create a new growth engine, MAFRA and RDA will continue to carry out a golden seed project, genome research, development of new bio materials. MAFRA is also financing a research project a stable supply of food grains with improved productivity and quality and is developing various practical technologies using biotechnology.

The National Institute of Ecology (NIE) was designated as the natural environmental risk assessment agency in February 2015. NIE conducts risk assessments of LMOs used for environmental remedy. NIE also carries out the consultation review of LMO FFP to assess the impact on the natural ecosystem and monitors the contamination of imported LMOs in Korea.

Section II. Plant and Animal Biotechnology:
Part A. Production and Trade

A) Product Development

The development of biotech crops is being led by various government agencies, universities and private entities. Research is mainly focused on 2nd and 3rd generation traits, such as drought and disease resistance, nutrient enrichment, transformation techniques, and gene expression. RDA approved a total of 347 research cases for field trials conducted by RDA's designated evaluation entities and private entities in 2014.

Academic and government experts are busy publishing papers on genetically engineered crops. For example, a 2009 survey of local scientific journals identified 380 papers on the subject, which were

published between 1990 and 2007. Among those papers were 99 on tobacco, 45 on rice, and 29 on potatoes.

RDA has 180 events in 17 different varieties of crops under development. These crops include some of the following: resveratrol enriched rice, vitamin A enriched rice, insect resistant rice, environmental stress tolerant rice, virus resistant pepper, vitamin E enriched beans, insect resistant beans, herbicide tolerant vent grass, virus resistant potatoes and Chinese cabbage, watermelon, sweet potato, and apples. Safety assessment data is currently being generated for six events in three crops; four rice, one pepper, and one cabbage and five events in flowers and vent grass. A local university developed a herbicide tolerance vent grass under RDA's Next Generation Bio-Green 21 Project that was submitted to RDA for environmental risk assessment in December 2014. Rice enriched with resveratrol, known to be an antioxidant polyphenol preventing heart disease and virus resistant pepper are now several steps ahead and RDA plans to submit the environmental risk assessment dossier for rice enriched with resveratrol by the end of 2015

A team from a government research institute has developed biotech sweet potatoes that are resistant to drought and saline to prevent desertification. The institute succeeded in growing the sweet potatoes in China's Kubuchi Desert and Kazakhstan, two of the largest semi-arid areas in Northeast Asia. They also started the genome decoding process for sweet potatoes in 2014 in coordination with Chinese and Japanese researchers. With decoded information, the team aims to grow a large amount of biotech sweet potatoes in areas affected by desertification in China, the Middle East, and Africa.

The private sector is also doing research on biotech crops. According to industry estimates, approximately 60 varieties are currently under development, although most of them are still at the laboratory stage. The one noteworthy exception is the virus resistant pepper, which has made progress but researchers are still apparently struggling with generating a dossier for the environmental risk assessment.

Although significant research has been done, the soonest one of these crops, most likely the herbicide resistant vent grass or resveratrol enriched rice, could finish the regulatory review process is five years. Commercialization is expected to take much longer and will be entirely dependent on the task of getting Korean farmers to first recognize the benefits and adopt this technology. Generating farmers' support to actively use this technology is considered key to increasing consumer confidence in biotech food.

B) Commercial Production

Despite substantial investment, Korea has yet to commercially produce any biotech crops.

C) Exports

Korea does not export any biotech crops as Korea does not commercially produce any biotech crops.

D) Imports

Korea imports biotech crops and products for food, feed and processing, but not for propagation. The United States is usually the largest supplier of biotech grains and oilseeds to the Korean market except for 2013 when U.S. grain exports were limited due to the severe drought in the United States in 2012. The United States returned to being the largest supplier of biotech grains in 2014 and 2015 followed by Brazil and the Ukraine.

In 2014, Korea imported 10.2 million metric tons of corn, which consisted of 8.2 million metric tons for feed and 2.0 million metric tons for processing. Imports from the United States reached 5.4 million metric tons, or 53 percent of the total. Imports of U.S. corn were comprised of 4.4million metric tons for animal feed, which was nearly all biotech corn. The remaining 1 million metric tons of U.S. corn was used for processing of which nearly two-thirds was biotech.

Imported biotech processing corn is generally used to make products like high fructose corn syrup (HFCS) or corn oil. Both are exempt from biotech labeling requirements since the biotech protein is undetectable. Despite mounting pressure from local NGOs and consumer groups, some processors continue using biotech corn since it is more affordable and easier to secure on the world market than conventional corn. Meanwhile, the processors producing flour, grits and flakes are importing identity preserved (IP) conventional corn from a variety of international suppliers.

In 2014, Korea imported 1.3 million metric tons of soybeans, three-quarters of which are used for crushing. The United States was the top soybean supplier, with imports totaling 608,117 metric tons, representing about 47 percent of all imports. Of that amount, 377,092 metric tons were used for crushing and 231,025 metric tons for food processing/sprouting.

Supplementing domestically produced meal, Korea imported 1.8 million metric tons of soybean meal in 2014. The United States was the third largest supplier behind Brazil and China with imports amounting to189008 metric tons, accounting for 11 percent of total imports.

Soybean oil is exempt from biotech labeling requirements since the modified protein is undetectable. Soybeans for food processing are used in products, such as tofu, bean paste, bean sprouts, and are IP-handled, non-biotech beans.

Table 1 contains import statistics for LMO soybeans and corn. This data differs slightly from the numbers reported in the preceding paragraphs since it is based on import approvals instead of customs clearance. Nonetheless, the information contained in the table reinforces the point that Korea imports a significant volume of LMOs for both food and feed purposes. Table 2 highlights the price difference between biotech and conventional grains.

Table 1: Imports Statistics for LMO Soybeans and Corn[1]

(Calendar year basis / Unit: 1,000 MT)

Classification			2011	2012	2013	2014	2015 Jan-May
			Volume	Volume	Volume	Volume	Volume
Soybean	Food (Crushing)	US	294	418	242	445	157
		Non-US	556	479	487	576	296
		Total	850	897	729	1,021	453
Corn	Food	US	920	42	57	706	249
		Non-US	105	1,094	861	556	144
		Total	1,025	1,052	918	1,262	393
	Feed	US	5,076	2,375	196	4,337	1,606
		Non-US	771	3,404	6,853	4,020	1,854
		Total	5,847	5,779	7,049	8,357	3,460
Oilseeds	Feed	US	52	33	27	79	65
		Non-US	78	113	120	102	20
		Total	130	146	147	181	85

Source: Korea Biosafety Clearing House

[1] Statistics are on an import approval basis and only cover biotech grains and oilseeds.

Table 2: Average Price Difference of U.S. Origin Non-LMO and LMO for Food Use in 2008

(Unit: Price for One Metric Ton / US dollars)

Crops	LMO	Non-LMO	Difference
Corn	329	386	57 (17.3%)
Soybean	564	768	204 (36.2%)

Source: Korea Biosafety Clearing House (KBCH)

Note: This is the latest data available from KBCH.

E) Food Aid Recipient Country

South Korea is not a food aid recipient. South Korea provides intermittent food aid to North Korea depending on the prevailing political conditions and is also considering making donations to third countries.

Part B: Policy

A) Regulatory Framework

Korea ratified the Cartagena Protocol on Biosafety (CPB) on October 2, 2007. On January 1, 2008 Korea implemented the LMO Act, which is the implementing legislation for the CPB and the overarching law governing the country's biotechnology related rules and regulations.

The LMO Act has a fairly lengthy history prior to implementation. The Ministry of Trade, Industry and Energy (MOTIE: formerly the Ministry of Knowledge Economy (MKE), which is the competent national authority, spearheaded the drafting of the Act and its underlying regulations back in early 2001. After several years and numerous iterations, MOTIE published drafts for public comment in September 2005. While the text of the Act and the lower level regulations were finalized just six months later in March 2006, the regulations were not implemented until January 1, 2008. After several attempts, the LMO Act was finally revised in December 2012 with a few modifications including a revised definition of stacked events. Overall, however, it failed to address U.S. concerns regarding redundant consultation reviews and did not make a distinction between LMOs-FFP and LMOs for propagation. The revised Act went into effect on December 12, 2013.

Roles & Responsibilities of Government Ministries

Ministry of Trade, Industry and Energy (MOTIE): National competent authority for the CPB, responsible for the LMO Act and issues related to the development, production, import, export, sales, transportation, and storage of LMOs for industrial use.

Ministry of Foreign Affairs (MOFA): National focal point for the CPB.

Ministry of Agriculture, Food, and Rural Affairs (MAFRA): matters related to the import/export of agricultural/forestry/livestock LMOs.

Rural Development Administration (RDA) (overseen by MAFRA): ERAs for biotech crops, environmental risk consultation for LMOs and leading developer of biotechnology crops in Korea.

Animal, Plant and Fisheries Quarantine & Inspection Agency (QIA) (overseen by MAFRA): import inspection of LMOs for agricultural use at the port of entry.

National Agriculture Product Quality Service (NAQS) (overseen by MAFRA): import approval of LMOs for feed use.

Ministry of Oceans and Fisheries (MOF): matters related to the trade of maritime LMOs including risk assessments for such LMOs.

National Fisheries Research & Development Institute (NFRDI), (overseen by MOF): import approval of fisheries and consultations for LMOs for marine environment.

Ministry of Health and Welfare (MHW): matters related to the import/export of LMOs used for health and pharmaceutical purposes including human risk assessments of such LMOs.

Korea Center for Disease Control and Prevention (KCDC) (overseen by MHW): human risk consultation for LMOs.

Ministry of Food & Drug Safety (MFDS) (under the Prime Minister's Office): matters related to the import/export of LMOs for food, pharmaceutical, and medical devices; food safety approvals of biotechnology crops; and the enforcement of labeling requirements for non-processed and processed food products containing biotech ingredients.

Ministry of Environment (MOE): issues related to the trade of LMOs that are used for the purpose of environmental remediation or release into the natural environment including risk assessments for such LMOs, not including agricultural LMOs for planting.

National Institute of Ecology (NIE) (overseen by MOE): import approval of LMOs under jurisdiction of MOE and environmental risk consultation for LMOs.

Ministry of Science, Information Communication Technology (ICT) & Future Planning (MSIP): issues related to the trade of LMOs that are used for testing and research including risk assessments for such LMOs.

Role and Membership of the Biosafety Committee and Its Political Implications

In accordance with Article 31 of the LMO Act, a Biosafety Committee was formed in 2008 under the Office of the Prime Minister and later moved under MOTIE in December 2013 in accordance with the LMO Act revision issued on December 11, 2012. The change of the Committee chair to the MOTIE Minister from the Prime Minister was not intended to downgrade the status of the committee but was meant to achieve more effective and efficient operation of the Committee. The Committee reviews the following factors relevant to the import and export of LMOs:

- Factors relevant to the implementation of the protocol
- Establishment and implementation of the safety management plan for LMOs
- Re-examination in accordance with the provisions of Article 18 and Article 22 of appeals by an applicant who fails to get import approval, etc.
- Factors relevant to legislation and notification pertinent to the safety management, import, and export, etc. of LMOs
- Factors relevant to the prevention of damage caused by LMOs and measures taken to mitigate damage caused by LMOs
- Factors requested for review by the Chair of the Committee or the head of the competent national authority.

The MOTIE Minister is the chair of the 15-20 member committee. Members include Vice Ministers from the seven relevant ministries noted above plus the Ministry of Planning and Finance (MOPF). Private sector specialists can also be members of the Committee. The Committee may have subcommittees and technical committees.

The most important role of the Committee is to reconcile different positions among the relevant ministries. As each relevant ministry holds authority and responsibility in its respective area, it may not be easy to reach consensus on some issues. In such cases, the MOTIE Minister as the Chair of the Committee can be called upon to resolve matters lacking consensus. While the frequency of meetings is not exactly known, it appears as though the committee meets very infrequently. The last meeting was conducted through document circulation rather than face to face in December 2014.

Political Influence

Regulatory decisions related to agricultural biotechnology are influenced by political pressure, mostly from vocal anti-biotech NGOs. Some of these outspoken organizations are appointed as members of the government's food safety and biotechnology risk review committees and use this position as a means to pressure the government to introduce more stringent biotech regulations. Three draft revisions to the Food Sanitation Act to expand biotech labeling requirements are good examples of political influence that is in response to the insistence of the vocal anti-biotech NGOs.

B) Approvals

Biotechnology crops are required to undergo a food safety assessment and environmental risk assessment (ERA). Of note, the ERA is sometimes referred to as a feed approval, though the review is largely focused on the impact to the environment, not animal health.

Several different agencies are involved in the overall assessment process. RDA conducts the ERAs to approve new events in feed grains. As part of the environmental assessment, RDA consults with three different agencies, including the National Institute for Ecology (NIE), the National Fisheries Research & Development Institute (NFRDI), and the Korea Centers for Disease Control & Prevention (KCDC). Meanwhile, MFDS conducts a safety assessment for food grains containing biotech events. The MFDS review process includes consultations with RDA, NIE and NFRDI.

The overlaps between the reviewing agencies, particularly between MFDS and KCDC and redundant data requirements have led to confusion and unnecessary delays in the approval process. Despite continued requests to simplify the current approval process by improving the redundant and duplicative approval processes through revision of the Consolidated Notice, the revision of the Consolidated Notice published on July 30, 2014 failed to address these requests.

MFDS has three categories of approval: full approval and two types of conditional approval. Full approval is given to biotech crops that are commercially produced and imported for human consumption. Conditional approval applies to those crops that have been discontinued or are not grown

commercially for human consumption.

As of July 2014, MFDS has granted food safety approval for 151 events including food additives and microorganisms out of a total of 166 submissions. Meanwhile, RDA has approved 113 events for use in feed out of a total of 144 submissions. See Appendix for a complete list of approved events.

Although no product has been approved for commercial production in Korea, a local university funded by RDA approached RDA in 2008 requesting the approval to plant biotech grass used for landscaping purposes. However, the submission, initially turned down due to insufficient data, was re-submitted with the requested data in October 2010. The developer again withdrew the submission in 2012 and submitted the new package with some modification in late 2014. The package is currently under review by RDA.

C) Field Testing

RDA authorized contained field trials for 330 events in 2014. From January to May 2015, a total of 269 field trials were approved. Many of the approved field trials are for traits with resistance to environmental stress. RDA renews the field trial permits every year. The lion's share of field trials are for rice with many different traits, such as environmental stress resistance, enhanced nutritional qualities, and insect resistance. Field trials for peppers, beans, cabbages and grass are also underway.

According to the Consolidated Notice, which is the implementing regulations of the LMO Act, in-country field tests are required for imported LMOs used as seed. For LMOs used as food, feed, and processing (FFPs), RDA will review the data from field trials conducted in the exporting country. However, if necessary, RDA may require in-country field tests for LMO FFPs.

The biotech crops being developed by RDA are subject to field trials and must follow the "Guidelines for Research and Handling of Recombinant Organisms Related to Agricultural Research." Biotech crops developed by private entities, including universities, should adhere to voluntary guidelines published by the Ministry of Health & Welfare, entitled "Guidelines for Research of Recombinant Organisms." The Consolidated Notice also includes guidelines for local biotech developers and laboratories to comply with during their research and development.

D) Stacked Events Approval

MFDS does not require a full safety assessment for stacked events if they meet the following criteria:

- The traits being combined were already approved individually
- There is no difference in the given traits, intake amount, edible parts and processing method in the stacked event and the conventional non-biotech counterpart
- There is no crossbreeding among subspecies

The Consolidated Notice released in December 2007 includes a provision for ERAs for stacked

events. The following documents need to be submitted to RDA:

1. Information to verify whether there is interaction of traits in nucleic acid inserted in the parental line
2. Available information pertinent to characteristics of the stacked event
3. Evaluation of 1 and 2 above
4. Confirmation from the developer who received approval for the parental event used in the stacked event and agreement for review of already submitted information for the parental event

RDA reviews the submitted documents. If there is interaction between traits in the inserted nucleic acid of the parental line or other differences are noticed, RDA will then require an ERA. Otherwise, a full ERA is not required.

Korea reviews multi-trait stacked events with crop-based information rather than information for individual intermediate events. This means that intermediate events are not subject to the review unless they become commercialized.

The approval process for stacked events is becoming reason for concern. Both RDA and MFDS allow the submission of a dossier for stacked events after all parental single events are approved in Korea. Considering the approval time needed for stacked events after submission, which is a minimum of 4 to 6 months and up to one year, developers have to delay commercialization of stacked events approved by USDA until Korea has finished approval.

E) Additional Requirements

For biotechnology crops for food or feed or for processing, no additional registration is required other than approval. For LMOs for propagation, however, the crop should complete the process to be approved as a seed.

F) Coexistence

As noted earlier, biotech crops are not yet grown in Korea. As a result, regulators have not developed co-existence policies, which will undoubtedly be controversial with organic production continuing to increase each year.

G) Labeling

With the restructure of the Korean government in 2013 under the new administration, the authority over labeling of unprocessed biotech agricultural products was moved to MFDS from MAFRA. Now, MFDS is responsible for establishing biotech labeling guidelines for both unprocessed and processed products and enforcing guidelines in the market place.

Both unprocessed biotech crops for human consumption and certain processed food products containing biotech ingredients must carry GM food labels. The stated purpose behind biotech labeling is to

respond to the consumers' right to know. But, since public sentiment generally tends to be anti-biotech, there are very, very few products on the market with a GM label.

With respect to processed products, including consumer-ready products, MFDS (formerly KFDA) requires biotech labeling for 27 categories of foods if ingredients derived from biotech are among the top five ingredients in the finished product and if a foreign protein or DNA is present in the finished product. Foods containing refined ingredients derived from these crops, such as soybean oil, high fructose corn syrup and raw sugar are currently exempt from labeling since the biotech protein in undetectable. However, vocal NGOs and consumer groups continue to push MFDS to expand its labeling requirements to include these products.

In 2008, during the candlelight protests against U.S. beef, consumer groups learned that some of the country's corn processors would be bringing in biotech corn for processing for the first time because of the short supply of conventional corn and rising international grain prices. These groups threatened to boycott products from food manufacturers using biotech corn ingredients. In response, 21 large companies jointly declared that they would not use ingredients derived from biotech corn in their products.

MFDS was also under mounting pressure from outside groups to expand its labeling requirements. In October 2008, MFDS responded to these pressures with a draft proposal to expand its labeling requirements to include undetectable products like soybean oil and high fructose corn syrup made from GM crops. MFDS had originally planned to finalize this proposal by April 2009, but the PMO intervened over trading partners' concerns as well local food manufacturers' concerns about upward spiraling inflation. In April 2012, MFDS re-attempted to move on an earlier proposal to expand its biotech labeling for the benefit of consumers' right to know. However, due to significant push back from the local food industry the PMO instructed MFDS to gather industry comments on the proposal. The proposal is currently pending PMO's deliberation although there does not appear to be any timetable for the deliberation.

In 2013, a total of three draft bills related to the Food Sanitation Act that would require expanded biotech labeling were submitted by lawmakers to the National Assembly. One of the four social evils identified by the new administration is food safety; the law makers submitted the draft bill to respond to local NGOs supporting the expanded biotech labeling. In addition, the detection of the GE wheat in Oregon State in 2013 added momentum to the local anti-biotech movement and these groups began to demand that the Korean government expand labeling requirements. A civic group called the "Citizen's Coalition for Economic Justice (CCCE)" formed the "Consumer Justice Center" in 2013. CCCE is one of the most vocal non-government organizations that have criticized the structural problem of the Korean economy and have demanded economic reforms. The center is headed by a former Agricultural Minister and has a goal of expanding biotech labeling under the pretext of the consumer's right to know. The center has been organizing meetings to debate labeling and keeps pressing MFDS to expand labeling requirements. The center also requested that MFDS provide the names of food manufacturers

that use biotech grains and the volume of biotech grains used by each company. MFDS refused the request as it is confidential information. The center claimed that they would take MFDS to court as consumers have a right to know that sort of information.

The local food industry is concerned that the proposal to expand GMO labeling would end-up misleading consumers, limit the available selection of products on the market, and increase production costs. For example, if implemented, food manufacturers would be unwilling to develop any food using these ingredients and supermarkets would shy away from carrying any GM-labeled product for fear of losing sales. The industry is also concerned that in the absence of scientifically verifiable measures there could be false labeling or documentation forgery for imported oil and syrups claiming to be non-GM but actually made of biotech enhanced crops. The domestic industry is demanding that MFDS delay implementation of the expanded labeling requirements until there are scientific methods available to detect biotech content or a system put in place that can prevent such falsely labeled products from entering Korea.

In MFDS's 2015 plan published on January 26, 2015, MFDS said that they planned to expand biotech labeling to any food products that contain detectable biotech ingredients. Under the current system, MFDS requires biotech labeling for products that contain biotech ingredients as one or more of the top five ingredients. MFDS will remove the top five ingredient criteria and will begin requiring any product that contains detectable biotech ingredients. This seems a compromise that MFDS made in response to extreme pressure from vocal NGOs demanding mandatory biotech labeling for all food made with biotech ingredients (both detectable and non-detectable products). Since expanding biotech labeling to non-detectable products will have a huge impact on industry, MFDS seems likely to keep its policy of not requiring biotech labeling for non-detectable products but will expand mandatory labeling to food products that contain detectable biotech ingredients beyond the top five ingredients. According to this plan, cooking oils and syrups will continue to be exempt from mandatory biotech labeling. MFDS has not released details of the plan.

In April 2007, MIFAFF revised its Feed Manual requiring retail packaged animal feed products to carry a GMO label when the product contains biotech ingredients. This labeling requirement was enforced beginning on October 11, 2007. There have been no reported problems due to the fact that nearly all animal feed products contain biotech ingredients and are therefore subject to this labeling requirement.

GM Labeling Requirements for Bulk Grains

- Shipments consisting of 100 percent unprocessed biotech crops for human consumption are required to carry labels stating "GM 'commodity'" (e.g. "GM soybeans")

- Shipments that contain some biotech-enhanced crops are required to carry labels stating that the product "contains GM 'commodity'" (e.g. "contains GM soybeans")

- Shipments that may contain biotech-enhanced crops are required to carry labels stating that the product "may contain GM 'commodity'" (e.g. "may contain GM soybeans").

GM Labeling Requirements for Processed Products

- Products that contain biotech corn or soybeans, which comprise less than 100 percent of the product ingredients, are required to be labeled as "GM food" or "food containing GM corn or soybeans."

- Products that may contain biotech corn or soybeans are required to be labeled "May contain GM corn or soybeans."

- Corn or soybean products that are 100 percent biotech products are required to be labeled "GM" or "GM corn or soybeans."

Unintentional Presence

Korea allows for up to a three-percent unintentional presence of approved biotech components in unprocessed non-biotech products (e.g. conventional food grade soybeans) which carry an IP or government certificate. This three-percent tolerance of biotech components in raw materials is the default threshold for processed food products that are subject to biotech labeling requirements.

Intentional mixture of biotech ingredients triggers the labeling requirement even if the final level of biotech presence is within the three percent threshold. Grains and processed food products within the three percent threshold are required to submit full IP documentation or a certificate recognized by the exporting government to be exempted from biotech labeling requirement.

Table 3: Unintentional GM Presence and GM Labeling

	Threshold	Label
Conventional Bulk Grain Shipments Containing Unintentional GM Presence		
with IP or government certificate	3%	GMO label is exempted.
without IP or government certificate	0%	GMO label shall be affixed.
Processed Products Containing Unintentional GM Presence		
with IP or government certificate	3%	GMO label is exempted.
without IP or government certificate	0%	GMO label shall be affixed.
Processed Products Containing Intentional GM Presence (in top five ingredients)		
- with IP or government certificate	3%	GMO label is exempted
- without IP or government certificate	0%	GMO label shall be affixed.
Processed Products Containing Intentional or Unintentional GM Presence (beyond top five ingredients)		
GMO label is exempted without any further documentation requirements.		
Processed Product Containing No Foreign DNA, such as syrups, oils, alcohols and processing aids		
GMO label is exempted without any further documentation requirements.		

Use of Labels Such as Biotech-Free, Non-Biotech, GMO-Free, or Non-GMO

A voluntary non-GMO label is permitted if the product is 100-percent non-biotech. As a zero tolerance standard applies, any products tested positive for GMO will be a violation of labeling standards. Therefore, MFDS does not encourage non-GMO or GMO-free labeling to prevent the misuse of such labels. MFDS does not allow a non-GMO or GMO-free claim for a product that does not have a commercially available biotech counterpart.

Importers must keep relevant documentation supporting their non-GMO claim. Such documents can include a testing certificate issued by MFDA accredited GMO testing laboratories stating that there is no GMO components present. See Attaché Reports KS1004 and KS1046 for more details on GM labeling.

H) Trade Barriers

LLRice: In 2013, MFDS discontinued mandatory arrival LLRice testing for all incoming US rice shipments, which had been required after its discovery in 2006. Instead, MFDS will select one quarter of the year to conduct LLRice testing for all incoming U.S. rice shipments for that given quarter under its monitoring program. MAFRA also removed requirements for a statement issued by USDA/GIPSA on laboratories participating in GIPSA's proficiency program and a non-GMO certificate issued by one of the participating laboratories in 2014. To date, only one test is required by the Korean state trading entity aT prior to loading.

MON71800 Wheat Event: After the detection of GE wheat (MON71800) in the state of Oregon in May 2013, MFDS started mandatory testing applicable to any wheat or wheat flour shipments originating from the United States in order to confirm the absence of the GE wheat. In August 2014, MFDS changed the requirement to require three consecutive clean test results for wheat shipments that are of the same type and originate from the same exporter and packing house. After three clean test results, wheat shipments from the same combination will return to normal inspection. For wheat for feed use, MAFRA tested imported wheat for years prior to the finding of the GE wheat in Oregon. After the finding, MAFRA expanded U.S. origin wheat sample sizes to test for the presence of the GE wheat. Testing conducted by the Korean government to date has all turned out negative.

Event 32 Test on U.S. Corn Shipment: MFDS is testing all U.S. origin corn shipments to confirm the absence of Event 32. White corn, sweet corn, waxy corn and popcorn are excluded from the testing requirement.

U.S. origin papaya and papaya products: MFDS does not allow imports of papaya and papaya products made of U.S. origin papaya as GM papaya produced in the United States has not been approved for human consumption by MFDS.

Approvals: There have been growing concerns over the risk assessment process for LMO FFP. Specifically, some facets of the risk assessment process are considered to be redundant, unprecedented and occasionally lack scientific justification. This cumbersome consultation process is

sometimes slow, contributing to delays in the final approval of new events.

Organics: Korea maintains a zero-tolerance policy for the inadvertent presence of biotech content in processed organic products. Despite the anticipation that Korea might change this policy in making regulations for MAFRA's new certification program for processed organic products beginning January 1, 2014, MAFRA adopted MFDS's zero tolerance policy in their final regulation. Any organic products tested positive for GMO will be instructed to remove an organic claim from the product label and NAQS may investigate the case to see if there is any intentional violation.

Expanded Labeling: As noted earlier, the stalled proposal and several draft revisions submitted by lawmakers to expand biotech labeling to non-detectable products would be very problematic and as such remains on the watch list.

I) Intellectual Property Rights

As noted in section above, biotechnology crops are not commercially planted in Korea. However, intellectual property rights are protected under the existing domestic regulations.

J) Cartagena Protocol Ratification

Korea ratified the Cartagena Protocol on Biosafety (CPB) on October 2, 2007 and implemented the LMO Act, the legislation implementing the CPB on January 1, 2008. The first revision of the LMO Act was issued in December 2012 and the revised LMO Act went into effect on December 12, 2013. MOTIE also revised its implementing regulations to harmonize with the revised Act in December 2013 and the Consolidated Notice in July 2014. Despite the revision, to improve the approval process, MOTIE failed to fully address concerns related to the redundancy of consultation reviews that the U.S. government has recommended for many years.

To address concerns from domestic industry and foreign trading partners on the "does contain" principle in the existing regulation, MOTIE revised the import approval application for LMOS for FFP, which is part of the Enforcement Regulations of the LMO Act, on April 30, 2013. The revised form clearly stipulates "may contain" principles for LMO FFP and therefore it eliminated concerns exporters and domestic importers had over the gaps between industry practice and principle in the written regulations. Korea allowed and continues to allow exporters to simply provide a list of all biotech events approved for use in Korea on the commercial invoice and importers can simply copy and paste the same list in the import application form.

K) International Treaties/Fora

Korea is actively participating in CODEX, IPPC, OIE, APEC and other meetings. Korea tends to loosely follow CODEX regulations in their safety assessment guidelines.

L) Related Issues

No further issues.

M) Monitoring and Testing

The National Institute of Environmental Research (NIER) under the Ministry of Environment (MOE) started monitoring for contamination of imported LMOs in Korea in 2012. NIER collected and tested total 626 samples of corn, soybean, canola and cotton countrywide. Of those samples, 42 samples from corn, canola and cotton were identified as LMOs. NIER ascertained that LMO plants propagated from LMOs imported for FFPs that were inadvertently released during transportation in Korea. NIER continued monitoring in 2013. The National Institute of Ecology (NIE), which replaced NIER as the designated natural environmental risk assessment agency has continued to monitor the fallout of imported LMOs in the Korean environment since 2014.

N) Low Level Presence Policy

Korea does not have a low level presence (LLP) policy. Instead, Korea uses the term "adventitious presence" in enforcing mandatory labeling and allows as much as 0.5% of the content of a non-LMO shipment to contain unapproved LMOs.

Part C: Marketing

A) Market Acceptance

There are contradictory views about biotechnology in the Korean marketplace. The public holds positive views on the use of biotechnology in human and animal research, bio-medicine, and in the treatment of disease while they tend to be negative towards the use of the technology to produce food.

B) Public/Private Opinions

Consumers are much more sensitive and generally negative towards the use of the technology to produce food and are therefore willing to pay more for non-GM food. Outspoken NGOs and the broadcast media tends to reinforce this negative image, vilifying foods made from biotech crops as 'franken food'.

The detection of the GE wheat in Oregon State in 2013 alarmed Korean consumers and media and was perceived as inadequate management of GE production in the United States. The detection gave a momentum to a civic group called the "Citizen's Coalition for Economic Justice (CCCE)" to demand expanded biotech labeling under the pretext of the consumer's right to know. The Center has organized multiple meetings to debate expanded labeling and keeps pressing the National Assembly and MFDS to expand labeling requirements. To address concerns raised by consumers and end-users, the Korean Flour Millers Association temporarily suspended the purchase of U.S. origin wheat for about a month until MFDS released its second test results for GE wheat in wheat and wheat flour imported from the United States. In light of these sensitivities, many local food manufacturers are very reluctant to use biotech ingredients. In fact, on the heels of the 2008 beef protests, twenty-one large food conglomerates, including several multinational companies, declared themselves GMO-free as a

marketing ploy. Local retailers are likewise reluctant to carry GM-labeled foods since they don't want to put product on their shelves that will not sell and would inevitably draw public scrutiny.

Nonetheless, Korea imports substantial amounts of biotech food ingredients for further processing into vegetable oil, corn syrup, and other products that are currently exempt from the GM food labeling requirements. The general public, though, seems unaware of this fact.

C) Marketing Studies

Consumer Group Survey

In July 2008, the Korea Consumer Union conducted a survey of National Assemblymen to gauge lawmakers' awareness about biotechnology. The survey showed that the ruling conservative Grand National Party (GNP) was more favorable towards the technology compared to the opposition Democratic Party (DP). Overall, though, both the GNP and DP have a rather negative perception of biotechnology.

Over 50 percent of the lawmakers felt uneasy about eating biotech food and more than 75 percent said that biotech labeling should be required for cooking oil. These findings, though, seemed somewhat out of place since over 60 percent of the lawmakers were aware that Korean regulators conduct safety evaluations of each biotech crop used in food and feed before allowing it to come into the country.

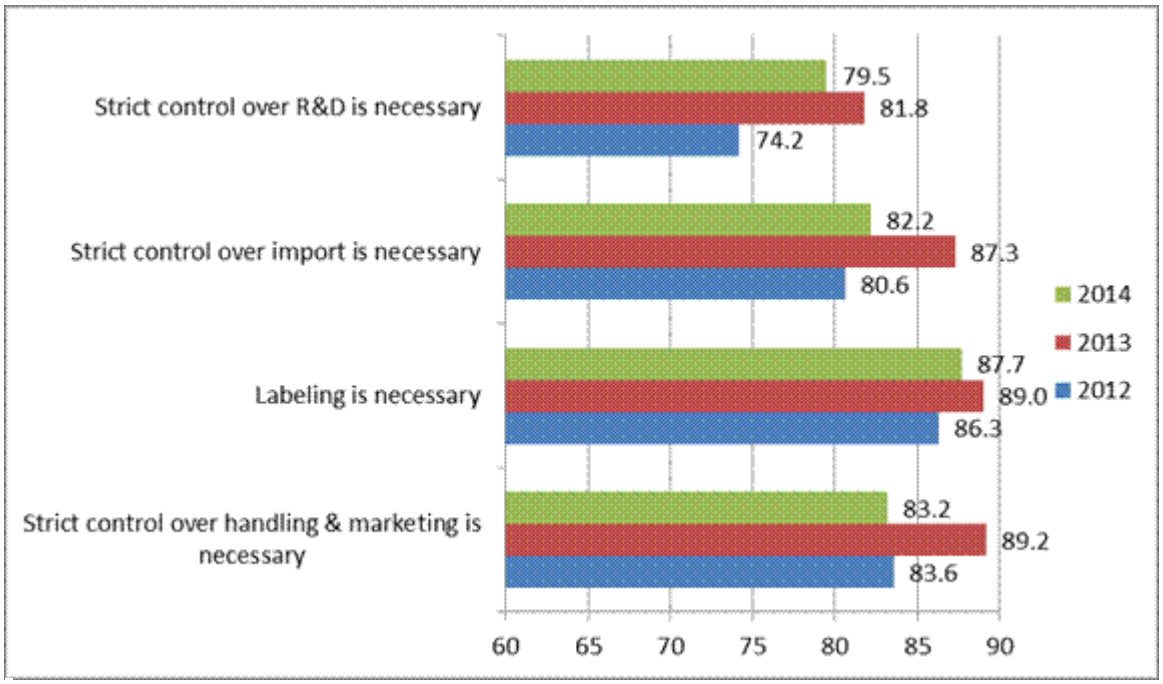
While consumers are apparently reluctant to eat biotech crops, the survey revealed that the Assemblymen were less concerned about locally developed biotech crops. About 7 percent of GNP and 24 percent of DP Assemblymen thought Korea should stop development of biotech crops. This is a noteworthy finding since it shows that one of the keys to improving consumer confidence in biotech foods lies in the development and commercialization of a Korean biotech crop. As noted earlier, while research is currently underway to develop the country's first biotech crop, commercialization is still several years away under the most favorable circumstances.

Korea Biosafety Clearing House Surveys

In November 2014, the Korea Biosafety Clearing House (KBCH) conducted its seventh annual survey of 600 consumers nationwide to gauge public perceptions on biotechnology.

The survey results showed that consumer awareness has continued to remain high while consumers still remain concerned over the safety of biotechnology. Over 4 48 percent answered that biotechnology would be beneficial to humans while 37.3 percent and 14.5 percent of respondents answered either neutral or not beneficial respectively. Over 64 percent answered that it was beneficial to curing diseases such as cancer and over 19 percent answered that it might help solve food shortage issues. Of those who answered it was not beneficial, 51 percent of respondents questioned the safety of biotechnology to humans and over 37 percent of the respondents thought that biotechnology used in making food was against nature.

The KBCH survey confirmed again that consumers were more favorable towards the use of the technology outside the agricultural sector. Over 83 percent and 81 percent of the respondents supported its use in the medical and bio-energy sectors respectively, while over 31 percent supported its use in livestock and 40 percent in food and agricultural products.



Concerning consumer acceptance, only 28.8 percent of respondents answered that LMOs would be well accepted by the society. Over 37 percent of the respondents answered that it was necessary for Korea to grow biotech crops and 23 percent that it would produce biotech animals in the country. About 20 percent responded that it was necessary for Korea to import LMOs produced in foreign countries. About 87 and 82 percent were in favor of labeling and strict import controls on biotech products respectively.

About 21 percent of the respondents were interested in LMOs. However, 59.9 percent of respondents were interested because of their concern over the safety of LMOs. The respondents obtained information on LMOs mostly from TV, followed by internet news.

In November 2008, the KCBH conducted a nationwide survey of 1,082 researchers from various backgrounds to gauge the academic community's perception of biotechnology. The survey results showed that around 44 percent of the respondents understood LMOs well. Over 69 percent thought that GMO was the most recognizable term for LMO. Eighty-five percent of the respondents thought that LMOs would contribute to the development of human life. The survey also revealed that researchers were more positive about LMOs used for pharmaceutical purposes than for food use.

PART D: Capacity Building and Outreach:

A) Activities

A number of activities have been organized and funded to provide biotechnology outreach in Korea:

1. Biotech briefings for participants in the State Department's International Visitors Program since 1999
2. Biotech press mission to the United States consisting of six reporters in 2000 sponsored by the USDA
3. Cochran Fellowship Program for three Korean biotechnology regulators in 2002
4. Video conference sponsored by the USDA for professors and media in 2002
5. Speakers from the USDA, the State Department, and other agencies/organizations for various local symposiums organized by Korean government agencies including KFDA, RDA, the Korea Research Institute for Bioscience and Biotechnology, etc.
6. U.S. Grains Council's (USGC) annual biotech program for media, NGOs, scientists, and high school science teachers, etc.
7. International Food Information Council speech and press outreach in June 2006
8. Presentation by an expert from North American Export Grain Association to Korean industry pertinent to the Cartagena Protocol on Biodiversity in December 2007
9. Presentation by U.S. Grain Council's invited speakers for science high school students, graduate students and professors at the university, the Korea Society of Food Science and Korean NGOs in May 2009
10. Presentations to universities by FAS/Seoul staff in 2007-2009
11. US Soybean Board-sponsored speaker visit to Korea in June 2011
12. USGC-sponsored educator mission to the United States in August 2011
13. USGC-sponsored trip for KFDA and RDA committee members in August 2011
14. Regulator to regulator meeting sponsored by the State Department and organized by FAS/USDA
15. USGC-sponsored trip for KFDA and RDA committee members in August 2012
16. USGC-sponsored trip for MFDS and RDA and their review committee members in July 2013
17. USGC-sponsored trip for a MFDS regulator and members of MFDS and RDA's review committee, a feed industry representative and a food security researcher in July 2014
18. USGC-sponsored trip for an MFDS regulator and members of the MFDS and RDA review committee in July 2015

B) Strategies and Needs

In 2012 and 2013, FAS Seoul organized a U.S. tour for a delegation of future farmers and farm leaders to learn about the use and application of biotechnology and other emerging technologies in the U.S. agricultural sector. This visit was notably different from past outreach efforts as it exclusively focused on the Korean young farm leaders rather than consumer and media interest groups, which generally tend to be negative towards the technology. Generating local farmers' support to adopt and actively use locally developed biotech crops is considered by many of the companies engaged in developing biotechnology as the lynchpin for increasing consumer confidence in biotech food as well as making the country's regulatory system more functional. The technology, if adopted, would also help bolster the nation's food security situation and help it to address critical structural problems such as rising cost of

labor. Post will seek a way to continue a similar tour program for young farm leaders in the future.

Chapter 2: Animal Biotechnology

Part E. Production and Trade

A) Product Development

Korea is actively using genetic engineering for the development of animals that produce new biomedicines, bio-organs, etc. Korea is also using cloning technology to expand the number of animals with a high capacity to produce such useful materials and bio-organs. The research is being led by various government agencies and private entities including academia.

In 2010, MIFAFF announced its overall plan for future growth engines for the life science industry in Korea. Biomedicine is one of the areas where considerable resources are being invested. RDA's Next Generation Bio-Green 21 Project launched on May 19, 2011 is also focusing on development of biomedicines and bio-organs as one of the three top sectors.

The National Institute of Animal Science (NIAS) of RDA is focusing on the development of new bio materials using biotechnology such bio-organs, securing diversity of animal genetic resources, developing high value added livestock products, developing renewable energy using livestock resources, with the goal of becoming a "world G7 livestock technology country" by 2015. NIAS is conducting research to develop 16 different traits in two animals; 11 traits in swine and 5 traits in chicken. These traits are designed to produce high value protein and anti-virus materials, swine producing material that can treat anemia, hemophilia, thrombus and chickens producing eggs with lactoferrin and antioxidant substances. NIAS has produced two transformed mini pigs that can be used to produce bio-organs. RDA is also conducting research to develop 24 different traits using silk worm. Traits under development will enable production of silk in various natural colors and medicine for humans. In 2012, RDA succeeded in transplanting a heart and a kidney from a transformed mini pig into a monkey. As follow up research in 2014, RDA succeeded in transplanting a heart from a transformed pig called GalT KO+MCP with genes inhibiting hyperacular rejection and acute vascular rejection into a monkey. However, all this research is still in the development stage and has not reached even the risk assessment stage although great efforts have been made. Currently, RDA does not have any plan to develop genetically-engineered or cloned animals for food use.

The Ministry of Science, Information Communication Technology (ICT) & Future Planning (MSIP) announced in July 2013 that they would invest 9.2 trillion won (approximately $8 billion) in the R&D of science technology for five years until 2017. MSIP designated 30 focused technologies that they will support during the five years and genetic resource technology to develop and commercialize value added life science resources is one of the 30 projects. MSIP will focus its investment on the development of new biomedicine and stem cell and genome research. In line with the MSIP investment plan, the Ministry of Agriculture, Food, and Rural Affairs (MAFRA) also announced the long and mid-term plan to promote agriculture technology in July 2013. In the plan, the technology to develop bio materials and transformed animals to produce pharmaceutical products has been set as one of the sub-projects under the four major research areas that MAFRA will focus on. The four major areas are 1) strengthening global competitiveness, 2) creating a new growth engine, 3) ensuring a stable supply of food grain, and 4) improving public happiness. Under the research to create a new growth engine,

MAFRA and RDA will continue to develop new bio materials using animal biotechnology.
In 2013, a team of professors from multiple Korean and U.S. universities announced that they succeeded in the production of a cloned mini pig named "GI Blue" whose gene to cause acute immune rejection response was removed. This is one step forward to the development of bio-organs and organ plantation in different species.

Private entities are also developing genetically-engineered animals that produce high value protein pharmaceuticals. In 2014, Choongbuk National University announced that they produced a transformed cloned pig with a trait that can control an expression timing of a particular protein. This technology will allow them to produce a great volume of proteins to cure people. In 2012, one pharmaceutical company announced that they produced 14 transformed pigs inserted with a human growth hormone gene (hGH) and those pigs produced milk in which hGH was expressed. This is one step forward to the development of a pharmaceutical product with hGH. Others are developing transgenic cattle that can produce lactoferrin and insulin, a fluorescent dog for human disease research, chickens that purportedly produce substances to cure leukemia and mini-pigs for production of bio organs.

In July, 2015, a team of professors from Korean and Chinese universities announced that they made a super pig which has higher muscle contents than ordinary pigs using a gene editing technology. The team removed a gene called MSTN, which inhibits muscle growth, from a somatic cell and cloned pigs using nuclear transplantation with the edited gene. The team sees that livestock industry might accept pork with more muscle and high in protein positively.

B) Commercial Production

Despite active research by Korean scientists, Korea has yet to commercially produce any genetically-engineered animals. It is too early to estimate how close Korea is to commercial production. As for food use, Korean scientists are unwilling to engage in research as they are concerned with consumer's acceptance of meat from genetically-engineered animals.

C) Biotechnology Export

Korea does not export any biotech animal as Korea does not commercially produce any biotech animals.

D) Biotechnology Imports

Korea imports genetically engineered mice and e-coli for research.

Part F: Policy

A) Regulation

The LMO Act and its implementing regulations apply to the development and import of genetically engineered animals. Pharmaceuticals produced from genetically-engineered animals are governed by the Pharmaceuticals Affairs Act. No specific regulation has been established for the management of genetically engineered animals.

B) Labeling and Traceability

MAFRA is responsible for the labeling and approval of genetically-engineered animals, but has not yet established any regulations. MFDS is responsible for the safety evaluation of genetically-engineered animals and fishery products for human consumption under its GMO safety evaluation guidelines.

C) Trade Barriers
No trade barriers have been identified.

D) Intellectual Property Rights (IPR)
As noted in the section above, biotechnology animals are not commercially grown in Korea. However, intellectual property rights are protected under the existing domestic regulations.

E) International Treaties/Fora
Not specifically related to genetically-engineered animals, but Korea is actively participating in CODEX, IPPC, OIE, APEC and other meetings. Korea is trying to loosely follow CODEX regulations in their safety assessment guidelines.

Part G: Marketing

A) Market Acceptance
There are contradictory views about biotechnology in the Korean marketplace. The public holds positive views about the use of biotechnology in human and animal research, bio-medicine, and in the treatment of disease while they tend to negative towards the use of the technology to produce food.

B) Public/Private Opinions

Many Koreans believe that biotechnology is an important frontier for the economic development of Korea in the 21st century. Proponents have had some success in making the case that biotechnology could be an engine for growth and could solve public health and environmental problems. Korea continues to expand investment on biotechnology research and development for biomaterial, biomedicine and organs, gene therapy, etc.

Despite the Korean government's support for biotechnology research, the Korean public has a negative perception of crops and foods produced through biotechnology. For meat or food from genetically-engineered animals, it is expected that the public will have even more serious concerns. Consequently, the majority of government funding for biotechnology research is directed toward non-agricultural projects such as biomedicine, stem cell research, cloning, and gene therapy. Koreans in general maintain a positive view towards non-agricultural biotechnology and believe biotechnology will play an important role in the country's economic development.

C) Market Studies
Not available.

Part H: Capacity Building and Outreach

A) Activities

Korea attended the second international workshop on the "Regulation of Animal Biotechnology: Preparing Markets for New Animal Product Opportunities" held in Brazil in August 2014. This allowed Korea to review the emerging elements of regulatory frameworks for the food and environmental safety assessment of products from animals produced using animal biotechnologies, including cloning, genetic engineering, and gene editing. Korea also attended the first workshop in 2011.

B) Strategies and Needs

No specific strategies or needs have been identified.

Section VII. Author Defined:

APPENDIX

TABLE OF APPROVED BIOTECHNOLOGY PRODUCTS AS OF JULY 2015

Note: Biotechnology crops are required to undergo a food safety assessment and environmental risk assessment (ERA). Of note, the ERA is sometimes referred to as a feed approval, though the review is largely focused on the impact to the environment, not animal health.

Crop	Event	Applicant	Trait	Approval	Approval Date
Soybean	GTS40-3-2	Monsanto	Herbicide Tolerance (HT)	Food & Feed	2010* & 2004
Soybean	MON89788	Monsanto	HT	Food & Feed	2009
Soybean	A2704-12	Bayer	HT	Food & Feed	2009
Soybean	DP-356043-5	Dupont	HT	Food & Feed	2010 & 2009
Soybean	DP-305423-1	Dupont	High oleic	Food & Feed	2010
Soybean	A5547-127	Bayer	HT	Food & Feed	2011
Soybean	CV127	BASF	HT	Feed & Food	2011 & 2013
Soybean	MON87701	Monsanto	IR	Food & Feed	2011
Soybean	MON87769	Monsanto	SDA	Feed & Food	2012 & 2013
Soybean	MON87705	Monsanto	High oleic	Feed & Food	2012 & 2013

Soybean	MON87708	Monsanto	HT	Feed & Food	2012 & 2013
Soybean	DP-305423-1 X GTS40-3-2	Dupont	High oleic, HT	Food & Feed	2011
Soybean	MON87701 X MON89788	Monsanto	HT, IR	Feed & Food	2012
Soybean	MON87705 X MON89788	Monsanto	High oleic, HT	Food & Feed	2013 & 2014
Soybean	MON87769 X MON89788	Monsanto	HT	Food & Feed	2013 & 2015
Soybean	FG72	Bayer	HT	Feed & Food	2013 & 2014
Soybean	MON87708 X MON89788	Monsanto	HT	Food & Feed	2013 & 2014
Soybean	SYHT0H2	Syngenta	HT	Food & Feed	2014
Soybean	DAS-68416-4	Dow	HT	Food & Feed	2014
Soybean	DAS-44406-6	Dow	HT	Food & Feed	2014
Corn	MON810	Monsanto	Insect Resistance (IR)	Food & Feed	2012* & 2004
Corn	TC1507	Dupont	HT, IR	Food & Feed	2012* & 2004
Corn	GA21	Monsanto	HT	Food & Feed	2010 & 2007
Corn	NK603	Monsanto	HT	Food & Feed	2012* & 2004
Corn	Bt 11	Syngenta	HT, IR	Food & Feed	2013* & 2006
Corn	T25	Aventis / Bayer	HT	Food & Feed	2003 & 2004
Corn	MON863	Monsanto	IR	Food & Feed	2003 & 2004
Corn	Bt176	Syngenta	HT, IR	Food & Feed	2003 & 2006
Corn[1)]	DLL25	Monsanto	HT	Food	2004
Corn[1)]	DBT418	Monsanto	HT, IR	Food	2004
Corn	MON863 X NK603	Monsanto	HT, IR	Food & Feed	2004 & 2008
Corn	MON863 X MON810	Monsanto	IR	Food & Feed	2004 & 2008
Corn	MON810 X GA21	Monsanto	HT, IR	Food	2004
Corn	MON810 X NK603	Monsanto	HT, IR	Food &	2004 &

				Feed	2008
Corn	MON810 X MON863 X NK603	Monsanto	HT, IR	Food & Feed	2004 & 2008
Corn	TC1507 X NK603	Dupont	HT, IR	Food & Feed	2004 & 2008
Corn	Das-59122-7	Dupont	HT, IR	Food & Feed	2005
Corn	Mon88017	Monsanto	HT, IR	Food & Feed	2006
Corn	Das-59122-7 X TC1507 X NK603	Dupont	HT, IR	Food & Feed	2006 & 2008
Corn	TC1507 X Das-59122-7	Dupont	HT, IR	Food & Feed	2006 & 2008
Corn	Das-59122-7 X NK603	Dupont	HT, IR	Food & Feed	2006 & 2008
Corn	Bt11 X GA21	Syngenta	HT, IR	Food & Feed	2006 & 2008
Corn	MON88017 X MON810	Monsanto	HT, IR	Food & Feed	2006 & 2008
Corn[2)]	Bt10	Syngenta	HT, IR	Food	2007
Corn	MIR604	Syngenta	IR	Food & Feed	2007 & 2008
Corn	MIR604 X GA21	Syngenta	HT, IR	Food & Feed	2008
Corn	Bt11 X MIR604	Syngenta	HT, IR	Food & Feed	2007 & 2008
Corn	Bt11 X MIR604 X GA21	Syngenta	HT, IR	Food & Feed	2008
Corn	Mon89034	Monsanto	IR	Food & Feed	2009
Corn	Mon89034 X Mon88017	Monsanto	HT, IR	Food & Feed	2009
Corn	Smart stack	Monsanto/ Dow	HT, IR	Food & Feed	2009
Corn	Mon89034 X NK603	Monsanto	HT, IR	Food & Feed	2010 & 2009
Corn	NK603 X T25	Monsanto	HT	Food & Feed	2010 & 2011
Corn	Mon89034 X TC1507 X Nk603	Monsanto/ Dow	HT, IR	Food & Feed	2010 & 2011
Corn	MIR162	Syngenta	IR	Food & Feed	2010 & 2008
Corn	DP-098141-6	Dupont	HT	Food & Feed	2010
Corn	TC1507 X Mon810 X	Dupont	HT, IR	Food &	2010

	NK603			Feed	
Corn	TC1507 X DAS-591227 X Mon810 X NK603	Dupont	HT, IR	Food & Feed	2010
Corn	Bt11 X MIR162 X MIR604 X GA21	Syngenta	HT, IR	Food & Feed	2010 & 2011
Corn	Event3272	Syngenta	Functional trait	Food & Feed	2011
Corn	Bt11 X MIR162 X GA21	Syngenta	HT, IR	Feed & Food	2011 & 2012
Corn	TC1507 X MIR604 X NK603	Dupont	HT, IR	Food & Feed	2011
Corn	MON87460	Monsanto	Drought Resistance (DR)	Feed & Food	2011 & 2012
Corn	Bt11 X DAS-591227 X MIR604 X TC1507 X GA21	Syngenta	HT, IR	Feed & Food	2011 & 2013
Corn	TC1507 X DAS-591227 X MON810 X MIR604 X NK603	Dupont	HT, IR	Food & Feed	2012
Corn	Bt11 X MIR162 X TC1507 X GA21	Syngenta	HT, IR	Feed & Food	2012
Corn	3272 X Bt11 X MIR604 X GA21	Syngenta	HT, IR	Feed & Food	2012 & 2013
Corn	MON87460 X MON89034 X NK603	Monsanto	DR, HT, IR	Feed & Food	2012 & 2013
Corn	MON87460 X MON89034 X MON88017	Monsanto	DR, HT, IR	Feed & Food	2012 & 2013
Corn	MON87460 X NK603	Monsanto	DR, HT	Feed & Food	2012 & 2013
Corn	TC1507 X MON810 X MIR162X NK603	Dupont	HT, IR	Feed & Food	2013
Corn	5307	Syngenta	IR	Feed & Food	2013
Corn	Bt11 X MIR604 X TC1507 X 5307 X GA21	Syngenta	IR	Food & Feed	2013 & 2014
Corn	Bt11 X MIR162 X MIR604 X TC1507 X 5307 X GA21	Syngenta	IR	Food & Feed	2013 & 2014
Corn	MON87427	Monsanto	HT	Feed & Food	2013 & 2014
Corn	MON87427 X MON89034 X NK603	Monsanto	HT, IR	Food	2014
Corn	MON87427 X	Monsanto	HT, IR	Food	2014

	MON89034 X MON88017				
Corn	TC1507 X MON810 X MIR604 X NK603	Dupont	HT, IR	Food & Feed	2014
Corn	DAS-40278-9	Dow	HT	Food & Feed	2014
Corn	GA21 X T25	Syngenta	HT	Food & Feed	2014
Corn	TC1507 X MON810	Dupont	IR, HT	Food & Feed	2014
Corn	DP-004114-3	Dupont	IR, HT	Food & Feed	2014
Corn	3272 X Bt11 X MIR604 X TC1507 X 5307 X GA21	Syngenta	IR, HT, α-amylase	Food	2014
Corn	MON89034 X TC1507 X MON88017 X DAS-59122-7 X DAS-40278-9	Dow	IR, HT	Food	2014
Corn	TC1507 X MON810 X MIR162	Dupont	IR, HT	Food & Feed	2015
Corn	NK603 X DAS-40278-9	Dow	HT	Food & Feed	2015
Corn	MON87427 X MON89034 X TC1507 X MON88017 X DAS-59122-7	Monsanto	IR, HT	Food	2015
Corn	DP-004114-3 X MON810 X MIR604 X NK603	Dupont	IR, HT	Food	2015
Cotton	Mon531	Monsanto	IR	Food & Feed	2013* & 2004
Cotton	757	Monsanto	IR	Food & Feed	2003 & 2004
Cotton	Mon1445	Monsanto	HT	Food & Feed	2013* & 2004
Cotton	15985	Monsanto	IR	Food & Feed	2013* & 2004
Cotton	15985 X 1445	Monsanto	HT, IR	Food & Feed	2004 & 2008
Cotton	531 X 1445	Monsanto	HT, IR	Food & Feed	2004 & 2008
Cotton	281/3006	Dow Agro Science	HT, IR	Food & Feed	2014* & 2008
Cotton	Mon88913	Monsanto	HT	Food & Feed	2006
Cotton	LLCotton 25	Bayer	HT	Food & Feed	2005

Cotton	Mon88913 X Mon15985	Monsanto	HT, IR	Food & Feed	2006 & 2008
Cotton	Mon15985 X LLCotton 25	Bayer	HT, IR	Food & Feed	2006 & 2008
Cotton	281/3006 X Mon88913	Dow Agro Science	HT, IR	Food & Feed	2006 & 2008
Cotton	281/3006 X Mon1445	Dow Agro Science	HT, IR	Food	2006
Cotton	GHB614	Bayer	HT	Food & Feed	2010
Cotton	GHB614 X LLCotton 25	Bayer	HT	Food & Feed	2012 & 2011
Cotton	GHB614 X LLCotton 25 X 15985	Bayer	HT, IR	Feed & Food	2011 & 2013
Cotton	T304-40 X GHB119	Bayer	HT, IR	Feed & Food	2012 & 2013
Cotton	GHB119	Bayer	HT	Feed & Food	2012 & 2013
Cotton	COT67B	Syngenta	IR	Feed	2013
Cotton	GHB614 X T304-40 X GHB119	Bayer	HT, IR	Food & Feed	2013
Cotton	COT102	Syngenta	IR	Food	2014
Cotton	281/3006 X COT102 X MON88913	Dow	IR, HT	Food & Feed	2014 & 2015
Cotton	MON88701	Monsanto	HT	Food & Feed	2015
Cotton	GHB614 X T304-40 X GHB119 X COT102	Bayer	IR, HT	Food & Feed	2015
Canola	RT73 (GT73)	Monsanto	HT	Food & Feed	2013* & 2005
Canola	MS8/RF3	Bayer	HT	Food & Feed	2005 & 2014
Canola	T45	Bayer	HT	Food & Feed	2005
Canola[1)]	MS1/RF1	Bayer	HT	Food & Feed	2005 & 2008
Canola[1)]	MS1/RF2	Bayer	HT	Food & Feed	2005 & 2008
Canola[1)]	Topas19/2	Bayer	HT	Food & Feed	2005 & 2008
Canola	MS8	Bayer	HT	Feed & Food	2012 & 2013
Canola	RF3	Bayer	HT	Feed & Food	2012 & 2013
Canola	MON88302	Monsanto	HT	Feed &	2014

				Food	
Canola	MON88302 X RF3	Monsanto	HT	Food	2014
Canola	MON88301 X MS8 X RF3	Monsanto	HT	Food & Feed	2014 & 2015
Canola	MS8 X RF3 X RT73	Bayer	HT	Food	2015
Canola	DP-073496-4	Dupont	HT	Food & Feed	2015
Potato[1)]	SPBT02-05	Monsanto	IR	Food	2004
Potato[1)]	RBBT06	Monsanto	IR	Food	2004
Potato[1)]	Newleaf Y (RBMT15-101, SEMT 15-02, SEMT 15-15)	Monsanto	IR, Virus Resistance (VR)	Food	2004
Potato[1)]	Newleaf Plus (RBMT21-129, RBMT21-350, RBMT22-82)	Monsanto	IR, VR	Food	2004
Sugar beet	H7-1	Monsanto	HT	Food	2006
Alfalfa	J101	Monsanto	HT	Food & Feed	2007 & 2008
Alfalfa	J163	Monsanto	HT	Food & Feed	2007 & 2008
Alfalfa	J101, J163, J101 X J163 [3)]	Monsanto	HT	Food & Feed	2007 & 2008
Alfalfa	KK179	Monsanto	Reduced Lignin	Feed	2015

Total Food Approval: 130

Total Feed Approval: 113

*** Food approval has been renewed 10 years after the first approval**

[1)] Conditional approval for discontinued items

[2)] Conditional approval for items that are not intended for commercialization

[3)] Conditional approval as other category and adventitious presence is accepted

Useful Acronyms

GMO: Genetically Modified Organism
LMO: Living Modified Organisms
LMO FFP: LMOs for Food, Feed and Processing
PMO: Prime Minister's Office
MFDS: Ministry of Food & Drug Safety
MHW: Ministry of Health & Welfare
KCDC: Korea Center for Disease Control and Prevention
ME: Ministry of Environment
NIE: National Institute of Ecology
MAFRA: Ministry of Agriculture, Food, and Rural Affairs
RDA: Rural Development Administration

QIA: Animal, Plant and Fisheries Quarantine & Inspection Agency
NAQS: National Agricultural Products Quality Management Service
NIAS: National Institute of Animal Science
MOTIE: Ministry of Trade, Industry and Energy
MOFA: Ministry of Foreign Affairs
MOF: Ministry of Oceans and Fisheries
NFRDI: National Fisheries Research & Development Institute
MSIP: Ministry of Science, Information Communication Technology & Future Planning
KBCH: Korea Biosafety Clearing House
HT: Herbicide Tolerance
IR: Insect Resistance
VR: Virus Resistance
DR: Drought Resistance