Chapter 6

Emerging Issues in Agricultural and Rural Policy

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Chapter 6. Emerging Issues in Agricultural and Rural Policy

1. Trade Liberalization & Agricultural Trade

Agricultural trade in Korea has gone through many changes from its focus on exports in the 1950s to become import-oriented today. During the 1950s, primary commodities played an important role as a source for acquiring foreign currencies. However, subsequent to the 1960s in which an economic development strategy of industrialization and export-orientation started to be implemented, the relative de-industrialization of agriculture deepened. In addition, the share of agricultural products in Korea's exports decreased significantly, falling from over 40% in the early 1960s to less than 1% in 2014.

Agriculture trade policy has been one of the many factors behind such changes in agriculture trade. During the 1960s and 1970s, agricultural export promotion policies were actively adopted as part of the government's export-oriented economic policy. During the 1990s, the need for agricultural export promotion policy increased even more as liberalization in the agriculture market expanded. On the other hand, the need for import regulation policies also increased in line with liberalization. However, trade policy regulations are gradually being lifted according to the WTO rules resulting from the conclusion of the Uruguay Round (UR) of negotiations. This section will provide an overview of Korea's agricultural trade and trade policy.

Liberalization of Agricultural Market in Korea

Prior to Uruguay Round Negotiations

Korea has continued to implement market liberalization policies since economic development was started in full scale in the 1960s. A key market liberalization policy of the 1960s was the conversion of Korea's import restriction regulations from a positive list system to a negative list system. In the late 1970s, import liberalization measures were further accelerated as the Korean economy achieved an export target of US$10 billion in 1977 driven by its outward-oriented growth policy. Such growth led to an increase in foreign currency reserves, which, in turn, increased pressures from foreign countries to open import market. Accordingly, the government established its import liberalization plan in 1978 and implemented substantial measures for import liberalization.

In the 1980s, market liberalization was further expanded with 1) the introduction of the import liberalization pre-notification system in 1984, 2) conclusion of the Korea-US trade negotiations in 1988, and 3) discontinuance of the application of the GATT's balance of payments clause (a.k.a. BOP graduation) in 1989. In particular, market liberalization in the 1980s was mainly targeted at agricultural products.

With the conclusion of the Korea-US trade negotiations in 1988, Korea opened its markets on 243 agricultural, forest and fishery products between 1989 and 1991. Due to Korea's surplus in balance of payments in the late 1980s, GATT requested consultations with Korea to determine whether to continue to apply Clause B of Article XVIII of the GATT to Korea. As a result, Korea agreed to discontinue its application of the clause in October 1989. According

to its agreement with GATT, Korea implemented its schedule to liberalize its import restriction items (273 items a.k.a. BOP items) in two phases over a 6-year period from 1992 to 1997 that was pre-notified on the import and export periodic bulletin. The pre-notification also called for imports subject to market liberalization to be evenly opened up each year in terms of the product numbers. However, as the Uruguay Round negotiations were concluded during the implementation period of the initial pre-notification plan (1992-1994), import items included in the second phase of the plan adhered to the agreements of the UR negotiations. In effect, market liberalization rates in the agriculture, forestry and fisheries sectors increased significantly in line with the gradual import liberalization pre-notification plan.

Result of the Uruguay Round Negotiations

The conclusion of the UR negotiations resulted in the acceleration of overall reforms and liberalization in the agriculture sector both domestically and internationally. Korea gradually opened up its agriculture and forestry markets, as a result of the UR agreements. With the partial opening of the fruit, vegetable and livestock markets in 1996 and 1997 and the liberalization of beef imports in 2001, only 16 rice-related products were not subject to automatic import approval. As import restrictions on those 16 items were transformed into a tariff system from 2015, Korea opened its entire agricultural and forestry markets.

New concession duties were set for 108 BOP items[1] as a result of

1) BOP products refer to the products which were under import restriction before the conclusion of the UR agreement but needed to be liberalized as consultation with the Committee on Balance-of-Payments Restrictions reached an agreement not to restrict import in 1989 citing a trade deficit as a developing country (according to Article 18, paragraph B, GATT).

the UR negotiations. Dairy products, seasoning vegetables, fruits, nuts, oil crops, and maniocs fell under this category. Among the BOP items, import quotas were maintained, while simultaneously raising custom duties, for a specified period for concession items. At the same time, imports were liberalized for non-concession items by setting ceiling binding tariffs. In implementing the UR agreements, Korea maintained its developing country status, which allowed for tariff reductions at an average rate of 24% (2/3 of industrialized countries) over 10 years from 1995. Korea expanded its products, subject to state trading and mark-ups, to 97 items in the UR agreements, while also designating 63 new items as subjects for specific tariffs.

As a measure to expand market access beyond tariffication and tariff reduction, Korea introduced and subsequently increased market access quotas. Arrangements to expand market excess include Minimum Market Access (MMA) and Current Market Access (CMA). Key products under MMA quota are rice, barley, sweet potatoes and potatoes, while beans, corn and peanuts are subject to CMA.

Livestock products consist of mostly BOP items that were liberalized at higher tariff rates, through tariff increases or ceiling binding tariffs, than the effective rates imposed prior to their liberalization. Korea was able to impose import restriction measures on beef up until 2000, but subsequently agreed to full liberalization in 2001. The market for pork has been fully open since July 1997 after a series of tariff and import quota increases. In the case of most dairy products, the market was fully opened in July 1996 after a period of tariff and import quota increases.

Some fruits and vegetables categorized as BOP items that had been protected by import restriction measures prior to the UR

negotiations became open to imports subsequent to 1995 through increased duties via ceiling binding tariffs. However, market liberalization for oranges, orange juice, grapes and apple juice was postponed one to one and a half years to begin market liberalization in 1996 (in the case of grapes and apple juice) or July 1997. On the other hand, there were also items that were liberalized at low tariff rates without any tariff increase measures, namely grapes, grape juice, apples, apple juice and other fruit juices. Key spice vegetables such as peppers, garlic and onions were liberalized from 1995 with increased duties imposed through ceiling binding tariffs.

Liberalization of Rice Market

In the UR negotiations, Korea opted to choose MMA quotas over tariffication in opening its rice market. While the principle of removing non-tariff barriers was decided at the UR negotiations, high tariffs (tariff equivalents) amounting to the price difference between domestic and overseas markets were also recognized to minimize the adverse effects of liberalization. However, several countries including Korea and Japan chose to grant a certain amount of rice quotas and discuss tariffication at later negotiations as opposed to accepting tariffication and the removal of non-tariff barriers.

Annex 5 of the WTO Agreement on Agriculture, which provides the basis for rice negotiations related to Korea, states that any negotiation on the question of whether there can be a continuation of the special treatment shall be initiated and completed within the time-frame of the last year of the implementation period, and if it is agreed that a Member may continue to apply the special treatment, such Member shall confer additional and acceptable concessions

as determined in that negotiation. While there are cases in which member countries that received special treatment have converted to tariffication (example: Japan and Taiwan), there have not been any instances of negotiating for the continuation of special treatment as with Korea. Korea notified the WTO Secretariat of its intentions to commence negotiations on rice on January 21, 2004. Stakeholder members were directed to communicate their intent to negotiate to both Korea and the WTO Secretariat to begin the negotiations on issues related to rice market liberalization.

A total of 9 member countries notified their intent to participate in the negotiations: the U.S., China, Thailand, Australia, India, Pakistan, Argentina, Egypt and Canada. With initial talks with the U.S. started on May 6, the rice negotiations were concluded through a series of over 50 consultations including 9 with the U.S., 6 with Thailand, 7 with Egypt and 5 with India. The agreements notified to the WTO are as follows: to continue special treatment for another ten years from 2005 to 2014; and to increase MMA volume by an equal amount annually from 225,575 tons (4.4% of domestic consumption during 1988-1990) in 2005 to 408,700 tons (7.96% of domestic consumption) in 2014.

As the special treatment Korea had enjoyed for the past two decades was over in 2014, the Korean government decided to implement a tariff scheme of rice from January 1, 2015. The rice tariff was set at 513%, and notified to the WTO in September 30, 2014. Korea's five major rice exporters, including the US, China, Thailand, Australia and Vietnam, raised concerns over the level, and Seoul will hold bilateral talks with the nations beginning in 2015.

Participation in WTO/DDA Negotiations

The UR agreements were implemented separately by developed countries and developing member states. The period for implementation was 6 years ending in 2000 for developed members and 10 years up to 2004 for developing economies. In line with this implementation schedule, the WTO initiated a new market liberalization plan, launching the Doha Development Agenda (DDA) at the Ministerial Conference in Doha, Qatar in November 2001.

Negotiations in the agricultural sector were already in progress according to the UR agreements, irrespective of the launch of DDA negotiations. Article 20 of the UR agreement on agriculture refers to the next round of negotiations by stating that "recognizing that the long-term objective of substantial progressive reductions in support and protection resulting in fundamental reform is an ongoing process, Members agree that negotiations for continuing the process will be initiated one year before the end of the implementation period." Accordingly, agriculture negotiations in the WTO were started at the March 2000 conference as stipulated by Article 20 of the Agreement on Agriculture. The WTO negotiations on agriculture, which have been discussed as a built-in agenda of the UR agreements, have developed in part into multilateral negotiations with the launch of the DDA negotiations in November 2001.

Negotiations under the Doha Round have fallen behind schedule through the stages of the first draft prepared by chairperson Harbinson in February 2003; the draft forwarded in the Cancún Ministerial Conference in September 2003; the "Framework" agreed in August 2004; the draft announced in Hong Kong Ministerial Conference in November 2005; the draft proposed by chairperson

Falconer in July 2007; the third draft of modalities proposed by Falconer and collapse of a small-scale ministerial conference in July 2008; and the fourth draft proposal of modalities and collapse of a small-scale ministerial conference in December 2008. In 2013, the "Bali Package" was adopted in the 9th WTO Ministerial Conference held in Bali, Indonesia, raising the possibility of concluding the Doha round. The decisions serve as a stepping stone towards the 10th WTO Ministerial Conference that will be held in Nairobi, Kenya in December 2015. Korea is actively participating in such multilateral negotiations, in an effort to better reflect the current situation for its domestic agricultural sector and prepare for global trends in market liberalization. Domestically, policy makers are devising compensation measures in response to a possible conclusion, while also expanding its financial support and investment in agriculture.

Market Liberalization through FTA Negotiations

Korea shifted its international economic policy towards further market liberalization subsequent to the financial crisis in the late 1990s. As part of its new policy, Korea actively pursued regionalism through FTAs and bilateralism in addition to its existing trade policy centered around the WTO and multilateralism. This, in effect, meant a policy shift towards utilizing FTAs as a means to revitalize the economy by 1) corresponding to the global expansion of FTAs, 2) improving international perception, 3) expanding foreign capital inflows and 4) exploiting new export markets. Subsequent to its policy conversion, Korea has simultaneously pursued FTAs with numerous countries in the 2000s. Since its first agreements with Chile in 2004, Korea has pursued FTA negotiations vigorously by

signing and implementing 11 agreements with 49 countries, such as Singapore, the European Free Trade Association (EFTA), the Association of Southeast Asian Nations (ASEAN), India, the European Union (EU), Peru, the US, Turkey, Australia and Canada. Free trade deals with Colombia, China, New Zealand and Vietnam were also reached and waiting for implementation.

Currently, Korea is in the middle of negotiating the Korea-China-Japan FTA, the Regional Comprehensive Economic Partnership (RCEP) agreement and the Korea-China-US FTA. The start of FTA negotiations with Indonesia, Japan, Mexico and the Gulf Cooperation Council (GCC) is under consideration. Meanwhile, Korea is making a proactive move to reach new foreign markets, as shown by its joint studies to prepare for FTA negotiations with the Southern Common Market (MERCOSUR), Israel, Malaysia and Ecuador.

FTA negotiations under way with three partner economies, efforts to resume negotiations on four FTAs and joint study to prepare for FTA negotiations with four partners, all stated above, have their own purpose and meaning. Through the Korea-China-Japan FTA and RCEP, Korea plans to lay the foundation for economic integration in Northeast Asia and East Asia. FTAs with Central American economies are expected to provide strategic points to target North and South America, and deals with Mexico and Ecuador could play a significant role in expanding trade with North and Latin American markets. Israel is an important base for entry into western part of Middle East. Indonesia and Japan are Korea's major trade partners, while GCC, MERCOSUR and Malaysia are significant markets with vast natural resources.

While Korea breaks into overseas markets by pursuing a

number of FTA negotiations simultaneously, its market opening in agricultural products has increased quickly. The Korea-Chile FTA, the country's first free trade deal, excluded most of Korea's agricultural commodities in a way that would minimize effects on the agricultural sector, by granting no concessions on rice and delaying negotiations on sensitive items to after the end of DDA. Some items such as grapes, kiwis and pork were included in the tariff phase-out. The Korea-ASEAN FTA was focused to protect the sector as well, through exclusion of most sensitive items or minimization of degrees of liberalization. In the negotiations on the free trade agreement with the US, rice and rice products were exempted from concession as well. Soybeans for food use, potatoes, skim and whole milk powders, condensed milk and natural honey from the US were given tariff-rate quotas (TRQs) while maintaining the current tariffs. Korean and US negotiators agreed to the establishment of seasonal tariffs on grapes and oranges, in pursuit of reducing impacts on Korean agriculture. Nonetheless, the Korea-US agreement is considered the most liberalized trade deal in Korean history of free trade agreements: the agreement's provisions either remove immediately or phase out import tariffs on most of US agricultural goods including beef, pork and chicken, except rice. Under the free trade agreement with the EU, Korea's trade barriers to some agricultural products such as dairy products and pork, except sensitive products including rice, are eliminated. As for the Korea-China FTA, which had been expected to have the greatest impact on agriculture of Korea, a two-stage negotiation on sensitive products led to the exemption of most of the main agricultural items from concession, reducing possible adverse impacts on the sector.

Agricultural Exports

Exports by Item

Korea's product exports jumped from $33 million in 1960 to $572.7 billion in 2014, while the share of agricultural exports in total exports has declined significantly since the early 1960s. After hitting its highest level of 43.1% in 1962, the share plummeted to 16.2% in 1970, 6.7% in 1980 and to 2.2% in 1990, and stays above the 1% level from 2012.

With the passage of time, Korean exports of agricultural products have undergone many changes. During the 1950s and 1960s, major agricultural exports included rice, cocoons, ginseng and tobacco. In the 1970s, canned mushrooms, chestnuts, mushrooms, arrowroot wallpaper, and oriental medicine herbs emerged as new export items while rice exports decreased sharply. Since the 1980s, the export of fruits, vegetables (kimchi, bell peppers, cherry tomatoes, eggplants, etc.), processed foods, pork and floricultural products, along with Korean traditional products such as ginseng, tobacco and chestnuts, increased significantly leading to diversification of Korea's export products.

Since the 1990s, fruits, vegetables, flowers and pork have emerged as new export items. The export of these products has been actively promoted by the government as they provide high values added and have a higher potential for exports. In particular, the exports of traditional Korean foods such as kimchi and soy fermented products, which have a direct impact on farm household income, together with greenhouse vegetables and floricultural products have recently increased. Major fruit exports include apples, pears and citrus fruits, while cucumber, tomatoes, onions, eggplants, carrots and kimchi are the main vegetable exports. The key export

Table 6-1 Korea's Agricultural Exports

Unit: million dollars

Year	Agricultural products			Livestock products	Forest products	Total
		Vegetables	Fruits			
2000	1,134	186	45	144	255	1,532
2005	1,899	231	121	173	150	2,222
2007	2,222	196	145	181	128	2,532
2008	2,715	234	155	215	119	3,049
2009	2,991	251	173	140	168	3,298
2010	3,722	277	195	146	214	4,082
2011	4,941	283	200	176	266	5,384
2012	4,785	331	222	395	465	5,645
2013	4,741	310	233	436	548	5,725
2014	5,224	313	259	470	489	6,183

Source: Ministry of Agriculture and Forestry, Major Statistics on Agriculture and Forestry, 2001, 2003, 2007 and 2010. Korea Agro-Fisheries & Food Trade Corp., kati.

items of floricultural products include roses, lilies, chrysanthemum, cactus and orchids.

In 2014, agricultural products whose export value was $100 million or higher included other prepared agricultural products ($830 million), tobacco ($700 million), confectionary ($490 million), alcohol ($400 million), noodles ($320 million), vegetables ($310 million), coffee ($310 million), sugars ($300 million), beverages ($280 million), fruit ($250 million), sauces ($190 million), ginseng ($180 million), and dairy products ($160 million). Exported items of $50 million or higher included feed ($92 million), protein ($65 million), leather

Table 6-2 Agricultural Export of Korea by Country

Unit: million dollars

	Japan	China	US	Hong Kong	Vietnam	Others
2000	697 (45.5)	118 (7.7)	145 (9.5)	134 (8.7)	8 (0.6)	406 (26.9)
2005	713 (32.1)	231 (10.4)	280 (12.6)	124 (5.6)	17 (0.8)	856 (38.5)
2007	646 (25.5)	295 (11.7)	302 (11.9)	183 (7.2)	41 (1.6)	1,105 (43.7)
2008	752 (24.7)	349 (11.5)	335 (11.0)	163 (5.3)	56 (1.8)	1,393 (45.7)
2009	846 (25.7)	420 (12.7)	338 (10.2)	142 (4.3)	87 (2.6)	1,423 (43.2)
2010	1,023 (25.1)	556 (13.6)	377 (9.2)	216 (5.3)	121 (3.0)	1,789 (43.8)
2011	1,381 (25.6)	915 (17.0)	419 (7.8)	274 (5.1)	214 (4.0)	2,180 (40.5)
2012	1,408 (24.9)	906 (16.1)	473 (8.4)	269 (4.8)	283 (5.0)	2,305 (40.8)
2013	1,287 (22.5)	948 (16.6)	523 (9.1)	346 (6.0)	354 (6.2)	2,268 (39.6)
2014	1,316 (21.3)	987 (16.0)	594 (9.6)	368 (6.0)	358 (5.8)	2,559 (41.4)

Note: Figures in brackets refer to percentages of the total.
Source: Ministry of Agriculture and Forestry, Major Statistics on Agriculture and Forestry, 2001, 2003, 2007 and 2010. Korea Agro-Fisheries & Food Trade Corp., kati.

($65 million), cocoa ($54 million) and baking related products ($52 million). There are no forest products whose export value is more than $100 million.

Exports by Country

The major importers of Korea's agricultural products are Japan, China, the US, Hong Kong and Vietnam. More than half of Korea's

agricultural exports are shipped to these five countries, though the share has been on a downward trend from 61.5% in 2005 to 58.6% in 2014.

Japan is the largest overseas market for Korean agricultural products, while its share of Korea's agricultural exports has declined from 32.1% in 2005 to 21.3% in 2014. Fresh agricultural products, such as chestnuts, pine mushrooms, kimchi, cucumber, tomatoes, flowers and bell peppers, are leading exports to Japan. China is the second biggest importer, with a share of 16.0% ($990 million) in 2014. China mainly imports sugar, confectionary, gum, ginseng and alcohol. The US share dropped from 12.6% to 9.6% during 2005-2014. Noodles, confectionary, fermented paste and pears account for most of exports to the US, while fresh produce has a small proportion. The share of Vietnam, an emerging importer of Korean products including chicken meat and mushrooms, has soared from 0.8% in 2005 to 5.8% in 2014.

Agricultural Imports

Imports by Item

Korea's imports of agricultural and forest products rose from $82 million in 1960 to $31.6 billion in 2014. The agricultural share of total imports declined every year from 24% in 1960 to 14% in 1980, 5.3% in 2000 and to 4.6% in 2005, until it rebounded in the mid-2000s, when FTAs began to be signed, to 5.3% in 2010 and to 6.0% in 2014. As of 2014, Korea's agricultural imports tripled than in the early 2000s.

Grains including cereal grains, pulses and potatoes hold the

largest share of agricultural products in Korean import market. Grain imports soared from only 2 million tons in 1970 to 5 million tons in 1980, and exceeded 10 million tons in 1990. In 2014, Korea imported a total of 16.8 million tons of grains. With a spike in grain imports, the country's grain self-sufficiency rate has declined from 80.5% in 1970 to 56.0% in 1980 and to 43.1% in 1990. In 2014 the rate stands at a mere 24.0%. The main imported grains include corn and wheat for feed, wheat for human consumption and beans. Corn imports have significantly increased since the mid-1970s, with a sharp rise in demand for feed corn driven by the increase in meat consumption. In 2014, 10.24 million tons of corn were shipped to Korea mainly from the US, Brazil, Ukraine and Russia. Wheat is imported for feed and food use. Wheat imports stood at 3.8 million tons in 2014, and major wheat exporters are the US, Australia, Canada and Ukraine. Up until the 1960s, soybeans were supplied domestically. With its self-sufficiency rate plunging and consumption increasing, however, soybean imports surged from 36 thousand tons in 1970 to 1.28 million tons in 2014. Soybeans are mostly shipped from the US, Brazil, Paraguay and China. Rice imports jumped every year following the UR agreement, reaching 410 thousand tons in 2014.

Imports of livestock products jumped from insignificant levels in the early 1970s to 499 thousand tons in 2003, with the increase in beef imports since the late 1970s. In 2004, meat imports fell to 370 thousand tons as beef imports from the US were prohibited due to the bovine spongiform encephalopathy (BSE) that broke out in the US at the end of 2003. After Korea lifted its quarantine inspection ban on American beef in 2007, beef imports rebounded and the imports of livestock products were recovered to 710 thousand tons in 2014,

Table 6-3 Agricultural Imports of Korea

Unit: million dollars

Year	Agricultural products			Livestock Products	Forest Products	Total
		Vegetables	Fruits			
2000	5,105	187	349	1,679	1,667	8,450
2005	7,397	330	616	2,361	2,131	11,889
2007	10,089	577	852	3,235	2,858	16,183
2008	13,905	582	823	3,352	2,864	20,120
2009	11,754	491	717	2,485	4,108	18,347
2010	13,988	720	945	3,123	5,219	22,330
2011	18,362	856	1,213	5,071	5,561	28,994
2012	13,717	839	1,412	4,721	6,010	24,447
2013	19,106	837	1,498	4,688	6,506	30,299
2014	19,308	798	1,677	5,622	6,705	31,635

Source: Ministry of Agriculture, Food and Rural Affairs (2015).

about doubling 2004 levels.

Fruit imports have increased substantially since the late 1980s in the wake of market opening, rising almost 10 times from $36 million in 1990 to $350 million in 2000. With the free trade deals with Chile and the US, fruit imports in 2014 reached $1,680 million, jumping almost five-fold compared to 2000. The major import fruits, which were limited to bananas, oranges, pineapple and grapes in early years, have been expanded to include cherries, kiwis, mangoes, lemon, cashews, grapefruits and cranberries.

Vegetable imports stood at $790 million in 2014, a big jump from $300 thousand in 1970. Key import items include chili peppers, garlic and onions, most of which come from China.

Imports by Country

Korea's imports markets for agricultural products are diversified compared to exports that show heavy reliance on major trade partners. The number of economies to sell their agricultural goods to Korea has increased further in recent years. The US, China, Australia, Brazil and Indonesia comprise the top five agricultural exporters to Korea. The share shrank from 63.1% in 2000 to 57.5% in 2014, though still at a high level. In addition to the top five, about 25 countries, such as New Zealand, Canada, Thailand, Chile, Malaysia and Vietnam, are exporting over $100 million worth of agricultural goods to Korea every year.

In 2014, the US exported $7.77 billion worth of agricultural products to Korea, comprising the highest market share of 24.6%. Items coming from the US include corn, beef, wheat, pork, soybeans, oranges and cherries. China came in the second with a market share of 14.7%. Its agricultural exports to Korea were $4.78 billion in 2014. China ships soybean meal, composite food preparations, rice, chili peppers and kimchi to Korea. As one of the largest agricultural producers, Australia is ranked the third. With growing demand for beef and noodles in Korea, agricultural imports from Australia reached $2.48 billion in 2014, over 3.2 times higher than in 2000. Beef, cane sugar, wheat, noodles and barley are top items headed from Australia. Imports from Brazil and Chile have skyrocketed since the 2000s. Brazilian agricultural exports to Korea were $2 billion in 2014, up nearly 9.2 times from $0.21 billion in 2000. The driving forces behind the surge were a rise in the value of imports of corn, soybeans, coffee and soybean meal caused by rising international crop prices, and an increase in the volume of chicken

Table 6-4 Korea's Agricultural Import by Country

Unit: million dollars

	US	China	Australia	Brazil	Indonesia	Others
2000	2,433.7 (28.9)	1,405.0 (16.7)	775.7 (9.2)	218.2 (2.6)	382.0 (4.5)	3,218.8 (38.2)
2005	2,198.5 (18.5)	2,216.5 (18.6)	1,359.5 (11.4)	582.1 (4.9)	362.2 (3.0)	5,169.7 (43.5)
2007	2,826.0 (21.2)	2,199.1 (16.5)	1,656.9 (12.4)	600.9 (4.5)	352.7 (2.6)	5,691.7 (42.7)
2008	3,554.2 (22.0)	3,100.7 (19.2)	1,692.6 (10.5)	823.9 (5.1)	412.6 (2.5)	6,598.5 (40.8)
2009	6,261.1 (31.1)	2,622.5 (13.0)	1,847.1 (9.2)	944.7 (4.7)	536.9 (2.7)	7,908.0 (39.3)
2010	4,467.5 (24.4)	2,822.1 (15.4)	1,600.8 (8.7)	1,466.0 (8.0)	593.4 (3.2)	7,396.7 (40.3)
2011	5,833.5 (26.1)	3,227.5 (14.5)	2,094.3 (9.4)	1,511.2 (6.8)	816.5 (3.7)	8,846.9 (39.6)
2012	7,550.9 (26.0)	3,999.5 (13.8)	2,709.1 (9.3)	1,607.7 (5.5)	933.4 (3.2)	12,193.5 (42.1)
2013	6,533.2 (22.2)	4,213.9 (14.3)	2,784.8 (9.5)	2,217.3 (7.5)	942.8 (3.2)	12,755.1 (43.3)
2014	5,941.7 (19.6)	4,713.4 (15.6)	2,348.1 (7.7)	2,868.3 (9.5)	1,015.2 (3.4)	13,412.7 (44.3)

Note: Figures in brackets refer to percentages of the total.
Source: Ministry of Agriculture and Forestry, Major Statistics on Agriculture and Forestry, 2005, 2010 and 2014. Korea Agro-Fisheries & Food Trade Corp., kati.

imports with growing demand in Korea. Imports from Chile soared as much as 19.6 times, to $800 million in 2014 from $40 million in 2000, as demand for Chilean products including grapes, pork and wine surged after the Korea-Chile FTA took effect.

Outlook and Tasks

In the wake of Korea's participation in multiple FTAs and subsequent tariff reductions, liberalization of Korean agricultural

market is expected to accelerate. As for existing FTAs, additional negotiations to cut down tariffs could result in a shift toward greater market opening. When DDA negotiations of the WTO reach a conclusion, the magnitude of market liberalization is expected to be bigger than the UR agreements, even if Korea maintains its developing country status. Furthermore, with the negotiations planned or currently underway with RCEP, MERCOSUR, Central America and Mexico, market liberalization through bilateral negotiations is projected to pick up speed as well.

Korea's agricultural policies in response to such market liberalization trends have been significantly restricted by WTO regulations. For that reason, Korea is converting its agricultural policies towards minimizing market distortions within the confines of WTO rules. Good examples of such policies are 1) direct income payment policy, 2) value-added improvement programs through the reinforcement of linkages with secondary and service industries related to agriculture, such as processing and storage industries, 3) marketing promotion programs for brand building and distribution efficiencies, and 4) increased education for farmers. Import regulation policies are also expected to be removed completely or relaxed with the exception of regulations related to sanitary and phytosanitary measures including the safety and pest control of agricultural import products. Furthermore, the relatively high level of custom duties currently maintained by the Korean government compared to industrial commodities is also expected to be lowered significantly.

Agricultural trade is expected to expand significantly, driven by imports rather than exports. In addition, the demand for a wide

range of high-quality agricultural products is expected to increase in line with Korea's economic growth and changes in social demographics. As a result, agricultural imports are also expected to increase. In particular, the increase in feed grain and meat imports is expected to continue as the demand for meat products rises, as well as imports of tropical fruits and vegetables. Furthermore, trade partners and items for agricultural trade are expected to expand. As trading partners for both imports and exports have already diversified, such trends are likely to accelerate further in line with the global expansion of market liberalization.

Diversifying trading partners and increasing trade flows are expected to increase the possibility of harmful pests and foods coming into Korea. Therefore, establishing and implementing measures to protect both the national health and natural environment from harmful pests, diseases and foods will emerge as the most important task in agricultural trade policy. Despite the gradual decline in the share of the domestic agricultural industry due to the expansion of agricultural market liberalization and subsequent increase in agricultural imports, social needs for multifunctionality (environment preservation, balanced national development, succession and development of traditional culture, food security, etc.) in the agriculture industry are increasing. Accordingly, another important challenge facing agricultural trade policy is figuring out how to achieve a balance between changes in the agricultural trade environment and the social need for agriculture.

2. Food Consumption & Related Policy

Changes in Consumption Environment of Agro-food

After the late 1980s, Korea underwent a transition from the quantitative growth phase of food consumption to the qualitative growth phase. As the conditions of food consumption, including factors related to economy, socio-demography and marketing environment, rapidly changed in recent years, consumption patterns and needs of consumers for food have also shifted, affecting food consumption.

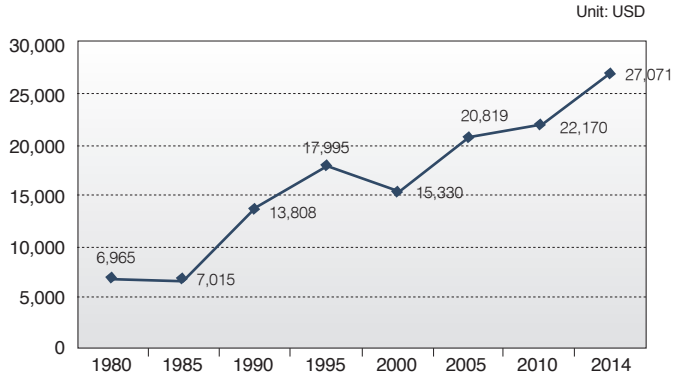
Economic Factors

The per capita income of Korea has been on the rise, although there have been fluctuations due to cyclical fluctuations and inflation of prices. The per capita income in 1980 (constant price of 2010) was only USD 6,965, but it continued to grow to USD 15,330 in 2000 and USD 27,071 in 2014, which is about 3.9 times up from the figure in 1980. With the increase in income, however, income inequality has also skyrocketed. Since 1995, the Gini coefficient based on market income has increased. In terms of urban households (families of two or more persons), the Gini coefficient of market income went up from 0.26 in 1995 to 0.30 in 2013.

Socio-Demographic Factors

The Korean population is rapidly aging due to a sharp fall in the birth rate and the extension of lifespan. The proportion of those aged 65 and over was a meager 3.8% in 1980, but it increased to 7.2% in 2000 and Korea entered the aging society. The proportion

Figure 6-1 Changes in Per Capita Income (Constant Price of 2010)



continued to grow to 12.7% in 2014, and is expected to reach 24.3% by 2030 and the country will become the super-aging society.

The number of single-person households is rapidly increasing due to the employment instability, aging population, the increase in the average age of first marriage, and prevailing individualism. The proportion of single-person households in the total households grew from 9.0% (1.01 million households) in 1990 to 23.9% (4.15 million

Figure 6-2 Changes in and Outlook for Population Structure

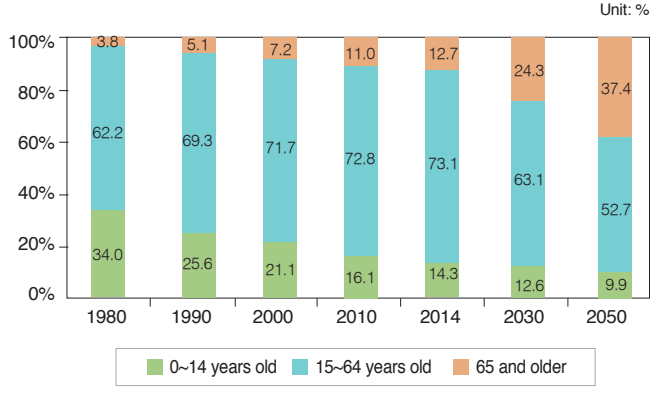
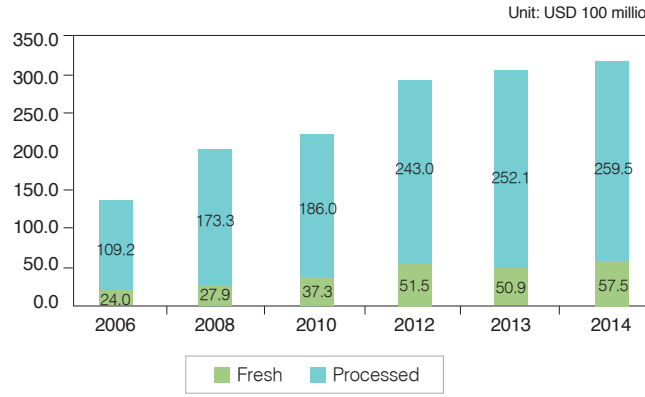


Figure 6-3 Status of Import of Agro-food



households) in 2010, and is predicted to reach 32.7% (7.09 million households) in 2030. In addition, the influence of female consumers is growing in the market as more women are participating in economic activities with the decrease in birth rate and the increase in highly educated women, and female householders are also on the rise. The ratio of women's participation in economic activities escalated from 42.8% in 1980 to 48.6% in 2000 and 51.3% in 2014.

Marketing Environmental Factors

As the conclusion of DDA and FTA negotiations accelerated the opening of the agro-food market, the import of agro-food has remarkably expanded. In 2014, a total of USD 31.7 billion of agro-food was imported: USD 5.75 billion of fresh agricultural products and USD 25.9 billion of processed food. This figure was 2.4 times up from that of 2006.

Since the 1990s, moreover, an increasing number of hypermarkets, department stores and convenient stores have

stepped into the consumption market as consumers put emphasis on convenience in shopping and prefer to purchase different types of commodities at one time. From 2010 to 2014, convenient stores accomplished an annual growth rate of 13.0% on average, and major retailers such as hypermarkets and department stores also saw an annual growth rate of around 5% on average. In addition, the advancement of information technology and the dissemination of various internet services have expanded e-commerce, which can ease the provision of information related to domestic and imported products and create a convenient shopping environment for consumers. The volume of e-commerce of agricultural products has continuously expanded, maintaining the average annual growth rate at 28.6% between 2001 and 2014. Furthermore, the dissemination of social network services has accelerated the access to and spread of information, affecting agricultural production, distribution and consumption in both direct and indirect ways.

Table 6-5 Sales Status by Type of Retail Business

Unit: KRW billion, %

	2010	2011	2012	2013	2014	Average annual growth rate
Department stores	24,752	27,564	29,056	29,800	29,323	4.3
Hypermarkets	38,059	42,190	44,838	45,905	47,497	5.7
Supermarkets	29,910	32,463	34,006	35,066	35,351	4.3
Convenient stores	7,809	9,203	10,884	11,728	12,744	13.0
Car and fuel retail stores	76,273	85,977	89,570	89,608	91,980	4.8
Specialty retail stores	100,553	105,815	105,794	103,108	101,719	0.3
Nonstore retailing	29,170	32,275	35,859	38,427	41,133	9.0
Total	306,524	335,485	350,006	353,642	359,743	4.1

Source: Statistics Korea, *Service Industry Survey.*

Table 6-6 Volume of E-Commerce of Agro-food

Unit: KRW billion, %

Classification	Total	Food	Agricultural, livestock and fishery products	Total of agro-food	Proportion of agro-food
2001	3,347	80	101	182	5.4
2002	6,030	210	307	517	8.6
2003	7,055	281	295	576	8.2
2004	7,768	371	280	651	8.4
2005	10,676	531	285	816	7.6
2006	13,460	625	312	938	7.0
2007	15,766	731	393	1,124	7.1
2008	18,146	1,009	493	1,503	8.3
2009	20,643	1,352	588	1,940	9.4
2010	25,203	1,642	681	2,323	9.2
2011	29,072	2,142	821	2,963	10.2
2012	34,068	2,892	956	3,848	11.3
2013	38,498	3,289	1,132	4,421	11.5
2014	45,302	3,611	1,171	4,782	10.6
Average annual growth rate	22.2	34.1	20.7	28.6	5.3

Source: Statistics Korea, *Online Shopping Survey.*

Changes in Trend of Agro-food Consumption

Changes in Composition of Household Expenses for Food

The proportion of dining-out expenses in the household expenditure for food between 2003 and 2014 has reached 46%, almost half of the total expenditure. As of 2014, in addition, the

Table 6-7 Changes in Average Monthly Consumption Expenditure for Agro-food by Item

Unit: KRW 1,000, %

Year	Consumption expenditure	Food	Grains and processed grains	Bread and rice cake	Meat and processed meat	Fishery product and processed fishery products	Dairy product and eggs	Fat and oils	Fruits and processed fruits	Vegetables and processed vegetables	Seaweeds and processed seaweeds	Sugars and confectionery	Seasonings	Other food products	Tea, beverages, alcohol	Eating-out expenses
2003	1,700.0	491.0	37.7	12.2	40.9	31.2	21.4	1.8	26.2	31.3	5.7	16.2	9.6	6.7	20.5	229.5
		(100.0)	(7.7)	(2.5)	(8.3)	(6.4)	(4.4)	(0.4)	(5.3)	(6.4)	(1.2)	(3.3)	(2.0)	(1.4)	(4.2)	(46.7)
2004	1,797.3	528.7	41.4	12.5	40.3	32.2	22.7	2.2	30.6	32.2	5.9	17.3	12.4	6.1	21.9	251.0
		(100.0)	(7.8)	(2.4)	(7.6)	(6.1)	(4.3)	(0.4)	(5.8)	(6.1)	(1.1)	(3.3)	(2.3)	(1.2)	(4.1)	(47.5)
2005	1,871.9	534.0	39.0	12.5	42.7	32.2	24.2	2.3	31.7	31.6	6.1	17.4	11.8	7.4	21.6	253.5
		(100.0)	(7.3)	(2.3)	(8.0)	(6.0)	(4.5)	(0.4)	(5.9)	(5.9)	(1.1)	(3.3)	(2.2)	(1.4)	(4.0)	(47.5)
2006	1,945.0	537.3	36.3	13.2	44.1	33.4	23.5	2.3	33.1	32.3	6.3	16.3	11.9	8.2	22.2	254.4
		(100.0)	(6.8)	(2.5)	(8.2)	(6.2)	(4.4)	(0.4)	(6.2)	(6.0)	(1.2)	(3.0)	(2.2)	(1.5)	(4.1)	(47.4)
2007	2,015.9	550.3	35.3	14.4	45.2	33.7	23.3	2.3	33.4	33.4	6.4	16.5	10.3	8.6	22.3	265.3
		(100.0)	(6.4)	(2.6)	(8.2)	(6.1)	(4.2)	(0.4)	(6.1)	(6.1)	(1.2)	(3.0)	(1.9)	(1.6)	(4.1)	(48.2)
2008	2,114.2	587.2	38.9	16.8	49.2	34.8	26.4	2.7	35.3	32.6	6.8	18.5	11.1	9.0	24.2	280.9
		(100.0)	(6.6)	(2.9)	(8.4)	(5.9)	(4.5)	(0.5)	(6.0)	(5.6)	(1.2)	(3.1)	(1.9)	(1.5)	(4.1)	(47.8)
2009	2,149.2	580.8	36.7	18.0	51.8	34.0	28.6	2.8	35.3	31.2	3.9	19.8	11.0	8.7	24.2	274.8
		(100.0)	(6.3)	(3.1)	(8.9)	(5.9)	(4.9)	(0.5)	(6.1)	(5.4)	(0.7)	(3.4)	(1.9)	(1.5)	(4.2)	(47.3)
2010	2,286.9	611.6	34.2	19.8	55.7	35.0	29.3	2.8	37.7	38.4	4.1	22.2	11.1	9.7	26.2	285.7
		(100.0)	(5.6)	(3.2)	(9.1)	(5.7)	(4.8)	(0.5)	(6.2)	(6.3)	(0.7)	(3.6)	(1.8)	(1.6)	(4.3)	(46.7)
2011	2,392.7	641.7	37.3	21.0	60.0	37.3	30.5	2.8	39.8	37.6	4.4	24.7	15.0	9.9	28.5	292.9
		(100.0)	(5.8)	(3.3)	(9.4)	(5.8)	(4.7)	(0.4)	(6.2)	(5.9)	(0.7)	(3.8)	(2.3)	(1.5)	(4.4)	(45.6)
2012	2,457.4	663.8	37.9	21.7	60.7	35.4	31.8	2.8	43.3	39.7	4.4	26.1	15.0	10.2	30.1	304.8
		(100.0)	(5.7)	(3.3)	(9.2)	(5.3)	(4.8)	(0.4)	(6.5)	(6.0)	(0.7)	(3.9)	(2.3)	(1.5)	(4.5)	(45.9)
2013	2,480.7	670.7	39.1	22.0	60.5	34.1	31.7	2.7	44.8	38.3	4.3	27.4	12.6	10.9	30.8	311.8
		(100.0)	(5.8)	(3.3)	(9.0)	(5.1)	(4.7)	(0.4)	(6.7)	(5.7)	(0.6)	(4.1)	(1.9)	(1.6)	(4.6)	(46.5)
2014	2,551.1	687.8	38.4	22.2	63.8	35.9	31.7	2.8	44.5	35.6	4.3	28.1	12.0	12.0	31.2	325.3
		(100.0)	(5.6)	(3.2)	(9.3)	(5.2)	(4.6)	(0.4)	(6.5)	(5.2)	(0.6)	(4.1)	(1.7)	(1.7)	(4.5)	(47.3)
03-14	3.8	3.1	0.2	5.6	4.1	1.3	3.6	4.1	4.9	1.2	-2.5	5.1	2.0	5.4	3.9	3.2

Source: Statistics Korea, *Household Income and Expenditure Survey*, each year.

proportions of meat and processed meat (9.3%), fruits and processed fruits (6.5%), grains and processed grains (5.6%), and vegetables and processed vegetables (5.2%) are also relatively high. In contrast, those of fat and oils (0.4%), seaweeds and processed seaweeds (0.6%), seasonings (1.7%), and other food products (1.7%) are relatively low.

The rate of increase in the average annual expenditure for food between 2003 and 2014 is 3.1%, which is lower than 3.8%, the rate of

increase in the total consumption expenditure. Among various types of food products, the rates of increase in bread and rice cake (5.6%), sugars and confectionery (5.1%), fruits and processed fruits (4.9%), meat and processed meat (4.1%), and fat and oils (4.1%) are relatively high. On the contrary, that of seaweeds and processed seaweeds (-2.5%) rather decreased, and those of grains and processed grains (0.2%) and fishery products and processed fishery products (1.3%) are relatively low.

Changes in Food Consumption Trend

With the changes in the conditions surrounding food consumption, consumers started to consider the quality and taste of food first rather than price when they choose food products. According to the 2013 Consumer Behavior Survey for Food conducted by KREI, a majority of consumers put quality first when purchasing rice, vegetables and livestock products, and taste first in case of fruits and processed food. As consumers have more concerns for health, it has become an important criterion in purchasing and consuming food. The result of the survey shows that 74.7% of the respondents are very concerned for health, and 50.1% selectively consume food to stay healthy. Almost half of the total households (47.5%) consume functional food, and 34.9% purchase eco-friendly food products usually. The proportion of households that purchase environmentally friendly products more frequently compared to the previous year (24.3%) is more than double that of households that purchase less than the previous year (10.7%).

Consumers who purchase more food on the internet with consideration for price, delivery and saving of time have gradually

Table 6-8 Level of Concerns for Health in Regard to Agro-food Consumption

Unit: %

Classification	Very much	Much	Moderately	Not much	Not at all
Interested in health	18.3	56.4	23.8	1.3	0.3
Choose healthy food	6.0	44.1	34.7	13.1	2.1

Source: KREI, *Consumer Behavior Survey for Food,* 2013.

increased. The 2014 Consumer Behavior Survey for Food finds that 15.4% of households (20.8% of households in the metropolitan area) usually purchase food on the internet. Although this proportion is not really high, the proportion of those who buy more food on the internet compared to the previous year is 26.8%, which is higher than that of households who buy less food on the internet (19.7%).

In general, Korean consumers have more concerns for domestic agricultural products (3.5 points out of 5 points) than local products (3.2 points) and eco-friendly products (3.1 points).

Nutrition Intake and Changes in Dietary Life

In terms of the amount of food intake categorized by food group, grains take up the largest proportion (19.2% as of 2013), followed by other groups of food with relatively large proportions: vegetables (19.0%), fruits (10.9%), beverages (10.8%), alcoholic beverages (8.3%), milk (7.8%), and meat (7.6%). Compared to 1998, the amounts of intake of grains (40.5g) and fruits (28.8g) dropped in 2013, while those of beverages (122g), alcoholic beverages (80.1g), meat (29.7g), and milk (41.0g) significantly increased.

Despite the increase in concerns of consumers for health and

nutrition, the intake of animal food is rapidly growing due to the expansion of western dietary life and dining-out. Accordingly, the proportion of fat in the total energy intake, which was a meager 5.7% in 1971, soared by 3.7 times to 21.2% in 2013. In contrast, that of carbohydrate in the total energy intake dropped by 17% points from 81.4% in 1971 to 64.1% in 2013.

If such a trend continues, it is very likely for Korea to have a nutrition structure as unbalanced as those of the US and Europe with the oversupply of fat. The prevalence rate of obesity among Korean adults (those who have a BMI over 25) is 37.6% for men and 25.1% for

Table 6-9 Amount of Intake by Food Group

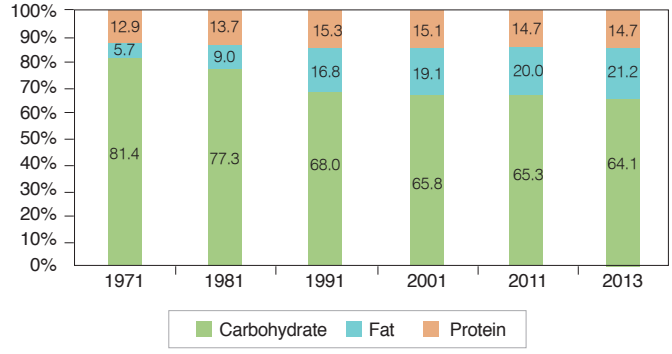
Unit: g, %

Classification	1998 (A)		2013 (B)		Change (B-A)	
	Intake	Proportion	Intake	Proportion	Intake	Proportion
Grains	337.2	26.4	296.7	19.2	-40.5	-7.2
Root and tuber crops	35.5	2.8	38	2.5	2.5	-0.3
Sugars	7.3	0.6	12.5	0.8	5.2	0.2
Pulses	31.0	2.4	36.2	2.3	5.2	-0.1
Seeds and nuts	3.0	0.2	5.9	0.4	2.9	0.1
Vegetables	291.5	22.8	293.1	19.0	1.6	-3.9
Fruits	197.1	15.4	168.3	10.9	-28.8	-4.5
Seaweeds	7.8	0.6	12.1	0.8	4.3	0.2
Beverages	45.3	3.5	167.3	10.8	122	7.3
Alcohol	48.9	3.8	129	8.3	80.1	4.5
Seasonings	26.0	2.0	39.4	2.5	13.4	0.5
Fat and oils	7.5	0.6	8.9	0.6	1.4	0.0
Meat	67.8	5.3	117.5	7.6	49.7	2.3
Eggs	21.7	1.7	29	1.9	7.3	0.2
Fish and shellfish	66.5	5.2	69	4.5	2.5	-0.7
Milk	79.7	6.2	120.7	7.8	41.0	1.6
Others	3.1	0.2	1.9	0.1	-1.2	-0.1
Total	1276.9	100.0	1545.5	100.0	268.6	0.0

Note: The data is from the result of a survey of the total Korean population aged over 1. The age is standardized by the estimated population of 2005.
Source: Ministry of Health & Welfare, *National Health and Nutrition Survey.*

Figure 6-4 Changes in the Ratios in the Total Energy Intake by Type of Nutrient

Unit: %



Source: Ministry of Health & Welfare, *National Health and Nutrition Survey.*

women. Furthermore, the rate of death from diseases mainly caused by changes in dietary life, such as the increase in animal fat intake, is also on the rise.

Development of Food Consumption Policy in Korea

The food consumption policy is targeted at the phases of selection and consumption of food and the intake of nutrients out of the entire scope of food-related policies. This policy includes part of the food marketing and price policies, and is also related to policies for food safety and quality, food nutrition, and dietary life. The food consumption policies implemented before the 1980s were focused on food marketing and price. After the 1980s, however, the attention of consumers moved from the quantitative aspect of food to the qualitative aspect. Accordingly, the proportion of the policies regarding food safety and quality in the entire food consumption policy has grown, and the significance of and concerns for nutrition

and dietary life have also expanded.

Food Safety and Quality Policy

The Ministry of Agriculture, Food and Rural Affairs (MAFRA), the Ministry of Food and Drug Safety (MFDS), and the Ministry of Oceans and Fisheries (MOF) supervise all the aspects of food-related policies from production to consumption of agro-food. Since 2013 when the status of the Korea Food and Drug Administration was elevated to the Ministry of Food and Drug Safety, the ministry has supervised the overall management of agro-food safety. However, the safety control in the production phase of agricultural, fishery and livestock products has been consigned to MAFRA and MOF. Accordingly, a variety of policies are being carried out by these three ministries to secure food safety and improve the quality of products.

One of the representative methods for implementing the food safety and quality policies is the food labeling/certification system. There are several types of labeling/certification systems: Good Agricultural Practice (GAP), the Environment-friendly Agricultural Products Certification, the Certification System for Organically Processed Foods, the Hazard Analysis Critical Control Points (HACCP), the Traceability System, and the Country-of-Origin Labeling System for Agricultural Products. In addition, a variety of other certification and labeling systems targeting agricultural, fishery and livestock products are being implemented.

GAP and HACCP were introduced as means of securing safety and hygiene of agro-food through precautionary management of hazardous factors, and are currently utilized as the representative systems for food safety control in the production phase. MAFRA is

in charge of supervising the implementation of GAP. The practical tasks related to HACCP are divided depending on the type of item and the phase: overall HACCP-related works are handled by MFDS, livestock-products-related works at farms, slaughterhouses and milk collection centers by MAFRA, and fishery products by MOF.

The Environment-friendly Agricultural Products Certification and the Certification System for Organically Processed Foods are supervised by MAFRA. In particular, the Environment-friendly Agricultural Products Certification used to be divided into three categories: organic, pesticide-free and low-pesticide food. However, the certification for low-pesticide produce ceased from 2010.

Moreover, with cases of cheap imported agricultural products disguised as domestic products increasing, the Country-of-Origin Labeling System for Agricultural Products was introduced in July 1991 to establish fair trade order and protect producers and consumers.

After then, the Country-of-Origin Labeling System for Processed Food was implemented in June 1993, and the Country-of-Origin Labeling System in Restaurants limitedly targeting beef to be grilled was adopted in January 2007. Currently, the Country-of-Origin Labeling System is applied to domestic and imported agricultural products and processed food, and the Country-of-Origin Labeling System in Restaurants is being implemented targeting five types of livestock products including beef and pork, rice (cooked rice), cabbage kimchi (chili powder included), nine kinds of fishery products including flatfish and rockfish, and marine products stored and displayed in a water tank for the purpose of selling and providing to customers after cooking them.

The Traceability System was first implemented targeting GAP model farms from 2003 to 2005 in order to investigate causes of safety problems of agro-food by tracking the relevant food and swiftly taking proper actions. Currently, the system is applied on a mandatory basis to beef, pork, and part of processed food, while other agricultural and fishery products are registered to the system on an autonomous basis. All works related to the traceability system for food products are handled by MFDS, those related to agricultural and livestock products by MAFRA, and those related to fishery products by MOF.

Food Nutrition and Dietary Life Policy

The significance of policies for food nutrition and dietary life has grown because of the westernization of dietary life due to the expanded opening of the agro-food market, and the increase in concerns for health due to economic growth and income increase. The food nutrition policy is a complex action connecting and adjusting various fields, such as production and supply of food, health care and education, in order for Korean people to maintain their nutritional health in the best condition. Such policies are aimed at securing health of the people and contributing to the growth of the nation. The food nutrition policies implemented before the 1980s were focused only on simple nutritional improvement of the disadvantaged without adequate interest or proper actions of the government. After the mid-1990s, however, changes in the economic and socio-demographic conditions of consumption led to the rapid shifts in the dietary life of Korean consumers. Moreover, as the prevalence rate of various types of chronic diseases caused by dietary life issues

has been on the rise, the awareness of the significance of food nutrition policies in regard to the health of the people started to spread. Accordingly, the government enacted the National Health Promotion Act in 1995 and made it mandatory for the central and local governments to implement nutritional enhancement projects. Furthermore, the government has run the National Health Promotion Fund, laying the legal groundwork for health-related policies, projects and related research. Since the 2000s, the significance of policies for food nutrition has been emphasized, and in recent years, the importance of dietary life education policies in addition to unidirectional government policies for nutrition and dietary life has spread, so that the government can help the people to be aware of dietary issues and solve the problems on their own. In the past, policies related to nutrition and dietary life were implemented and led by the Ministry of Health and Welfare (MW) and the Korea Food and Drug Administration (currently the Ministry of Food and Drug Safety), an affiliated organization. However, as the significance of the connectivity between different sectors from production to consumption of food has expanded, the role of MAFRA in dietary-life-related policies has grown.

Major actions related to the policies for food nutrition and dietary life taken by the government in the 2000s include the Special Act on Safety Management of Children's Dietary Life (MFDS as the competent authority) in 2008, the Support of Diet Education Act (MAFRA as the competent authority) in 2009, and the National Nutrition Management Act (MW as the competent authority) in 2010. Projects such as the Designation of High-Calorie, Low-Nutrient Foods Subject to Restriction or Prohibition on Advertisement and the Establishment and Operation of Children's Meal Service Support Centers

could be carried out on the authority of the Special Act on Safety Management of Children's Dietary Life. Moreover, the Support of Diet Education Act enabled the establishment of basic plans for dietary life education and the implementation of related projects, and the National Nutrition Management Act accelerated the establishment of basic plans for national nutrition management and the implementation of related projects.

3. Agricultural Budget[1], Investments and Loans

Agricultural Budgeting System

Government budgets are divided into subsidies and loans in terms of project support schemes. In addition, they are also divided into central government and local government budgets, each of which has general accounting and special accounting.

The special account is a budget scheme that does not comply with the principle that disallows budgets for a special purpose and which is a general principle of budgeting, and in which account is not integrated for executing special policy projects with their focus on stabilized budgets. A fund is for specially managing and flexibly using funds to execute budgets by connecting the funds to a specific project more closely than the special account. The ministry responsible for the project becomes a managing authority.

The agricultural sector has a complex budget structure with five special accounts including the Special Accounts for the Structural Improvement of Agricultural and Fishing Villages and the Grain Management Special Account, and seven funds including the Farmland Management Fund, the Fund for Stabilizing Agricultural Product Prices, and the Direct Payment Fund for Compensating for Farmer's Income Loss.

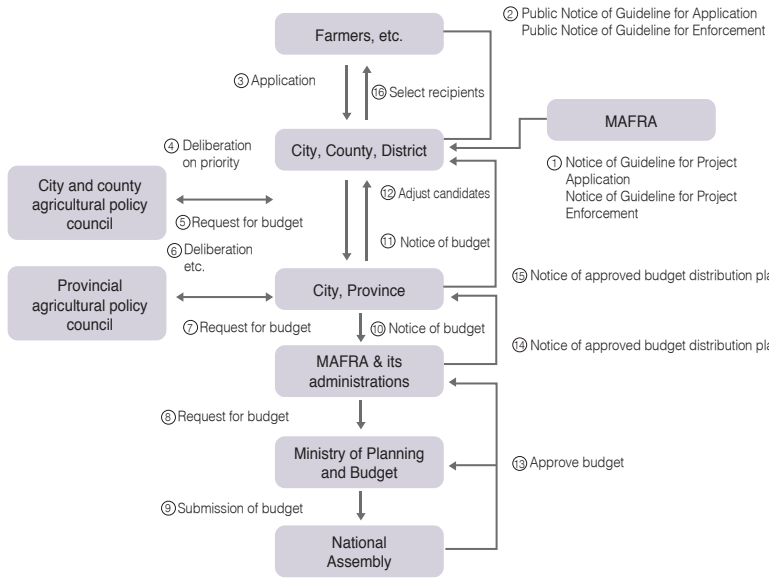
The project expenditure in the agriculture budget is spent for direct investment by the government and related authority or lending to farmers. Loans for business operators are provided through agriculture-related special accounts or funds and are named as a

1) This means budgets for the agricultural and rural sectors here.

policy loan. The financial resources of policy loans are based on the government's budgets, or using commercial banks by compensating the gap of interest with the govt's budgets (interest make-up).

The investment and loan project for agriculture and forestry utilizes the bottom-up approach for adjusting and budgeting a project when an enterpriser applies through the government's administration system. To this end, cities, counties and provinces have their own agricultural policy council to examine projects applied in their district under jurisdiction to request MAFRA (Ministry of Agriculture, Food and Rural Affairs) or concerned administration to budget for the projects. MAFRA and concerned administration request the Ministry of Planning and Budget to budget for the

Figure 6-5 Agricultural and Forestry Investment and Loan System



projects, which submits the budget plan to the National Assembly to obtain approval (Figure 6-5). MAFRA publishes the Guideline for Agricultural and Forestry Investment and Loan Project every year, which includes agricultural and forestry investment and loan projects and the application process, scale and details of support for providing transparent policy project information.

Scale of Agricultural Budgets and Portion of Each Sector in 2015

The budgets for agriculture are 19 trillion 300 billion won including those for subordinate administrations in 2015, 3.1% more than last year, and account for 5.1% in the entire budgets of the Korean government. The budgets for MAFRA only are 14 trillion 43.1 billion won, 3.0% more than last year.

Table 6-10 shows budgets for each project sector focusing on the budgets for MAFRA. The project cost accounts for 97% in the entire budgets, and the budgets for grain management and agricultural product distribution account for 26.7%, the greatest part based on the budgets in 2015. The budgets for enhancing the soundness of agriculture account for 23.4%, and those for stabilizing farm income and management and for creating production bases account for 19.4% and 17%, respectively.

Although the rural development and welfare promotion sector accounts for 13.5% of the total budget and is the smallest in the five sectors, the ratio is significantly higher than in the past, suggesting that the importance of rural policy has gradually increased.

Although changes in expenditures of agricultural budgets for each sector show an increase in quantity in comparison with 2010,

Table 6-10 Budgets of MAFRA and Distribution by Project Sector

Unit: 100 million won, %

Category		2014 (A)	2015 (B)	Year on Year (B-A)/A
Total expenditure		136,371	140,431	3.0
Sector	● Project expenditure	132,881	136,860	3.0
	◉ Agriculture, rural areas	124,528	127,451	2.3
	• Enhance soundness of agriculture	31,059	29,844	△3.9
	• Stabilize farm income & management	23,230	24,663	6.2
	• Promote rural welfare	4,277	4,565	6.7
	• Rural development	12,172	12,664	4.0
	• Grain management, agricultural product trade	33,656	34,031	1.1
	• Create agricultural production infrastructures	20,133	21,685	7.7
	◉ Food business	7,723	8,401	8.8
	◉ Other project expenditure	631	1,008	59.8
	● Basic expenditure	3,490	3,571	2.3

Source: Ministry of Agriculture, Food and Rural Affairs.

the sector for enhancing the soundness of agriculture shows continuing increases, and the sector for stabilizing farm income and management increased again compared to the late 2000s. The sectors for grain management, agricultural trade, rural development and welfare enhancement generally show a similar tendency.

Changes in Allocation of Agricultural Finance

Financial investment and loan policies of the government for the agricultural and rural sector have altered to reflect the

changing policy environment and national policy philosophy of the government. The Kim Youngsam Administration (Moonmin Administration) focused on structural improvement and enhancement of competitiveness on the assumption of agricultural market opening and distributed resources mainly to modernize facilities and improve production infrastructures for scale-up and specialization centering on selected medium- and large-scale farmers. The policy contributed to planning and executing investment and loans totaling 42 trillion won between 1992 and 1998, and the Special Tax Program for Rural Areas of 15 trillion won between 1995 and 2004. However, the expanded investment and loans focusing on scale-up, specialization, advanced facilities and high-tech agriculture for selected farmers did not bring increased income, but contributed to increasing debts and repayment burdens. In the end, the burden pushed many farmers close to bankruptcy.

While it was required to focus on tackling the currency crisis in 1997 and addressing farmers' debts, the Kim Daejung Administration (People's Administration) also allocated many financial resources to stabilize farm management. The People's Administration enforced actions consecutively from 1998 to 2003 to extend the repayment periods and lower interest rates. As a result, the financial distribution for stabilized management was also affected until the late 2000s, and 75.5% of the expenditure for the sector for compensating for farm income loss and stabilizing management was used for mitigating the burden of debts and stabilizing management in 2008. The People's Administration considered that the policy of structural improvement and enhancement of competitiveness by the Moonmin Administration was just for a small number of the elite,

and thus emphasized keeping the agricultural structure focusing on family-centered agriculture, innovative distribution and agricultural policy embracing consumers. The People's Administration planned investment and loans of 45 trillion won for six years (1999 to 2003) following the first investment and loan plan by the previous Moonmin Administration. However, the agricultural policy of the People's Administration was not greatly different from that of the Moonmin Administration in terms of financial management except the features of financial distribution due to the situation of the currency crisis and farm household debts. The distribution of financial resources for each project sector did not greatly change.

While actively promoting the FTA strategy simultaneously with a plurality of nations including the FTA with the US to respond to the sluggish progress of the Doha Round, the Roh Moohyun Administration planned investment and loans for the agricultural and rural sector to comply with the strategy. The Master Plan for Agriculture and Rural Areas for investing 119 trillion won for 10 years from 2004 to 2013 focused on maintaining the rural population by improving the quality of life in rural areas, while providing compensation for the income loss due to FTAs and expanding investments to enhance competitiveness. The Plan aimed to expand the Direct Payment Program for compensating for farm income loss to account for 22% in the agricultural and forestry budgets by 2014, and to invest 22 trillion won in the policy for improving the quality of rural life. The proportion of the amount executed for the rural sector in the 119 trillion investments and loans increased from 8.8% won in 2004 to 15.3% in 2008. The industrial policy focusing on agriculture was shifted to include the

rural and welfare policy.[2)]

In the late 2000s, the Lee Myungbak Administration (MB administration) concluded that a new growth engine was required for finding a way to change a situation in agriculture characterized by long-term depression and the rural sector that was losing vitality in spite of funds being successively invested. The MB Administration connected the food industry with agriculture that supplies major materials to develop it into a new growth industry. It supported scaling-up of agriculture by focusing on exports and further supported and invested in the horse industry with growth potential due to new demand, the pet industry, and the insect growing industry. The rural policy focusing on rural welfare for improving the quality of rural life and regional development was similar to that of the previous Administration. Meanwhile, the MB Administration concluded that investment and loans for agriculture and rural areas were executed inefficiently so far, and changed the policy by focusing on efficient financial resource distribution through restructuring subsidies and integrating or abolishing similar projects from 2009 to improve the efficiency. While there was a growing concern about fluctuating consumer prices resulting from increasing currency supply to cope with the global financial crisis in 2008, even more financial resources were provided for stabilizing prices of agricultural products.

The Park Geunhye Administration specified the basic direction of agricultural policy in 2013 as realization of 'Hopeful agriculture,

2) This is for adjusting financial allocation close to the assertion of the Rural Development Committee in 1994 to change an agricultural policy base to 'sound agriculture and fishery, development of rural areas as a location for various industries and a bountiful living space, and improved rural welfare similar to the urban level' (Rural Development Committee, 1994, p14).

Table 6-11 Changes in Basic Direction of Policy Initiatives (2000-2013)

	Basic Direction of Policy Initiatives
2000-2003	Stabilize farm management, improve agricultural competitiveness, and implement efficient distribution
2004-2008	Master Plan for Agriculture and Rural Areas Agriculture: improve conditions, Farmers: expand the Direct Payment Program and stabilize management Rural areas: welfare expansion for improving the quality of life and regional development
2009-2012	Efficient allocation of financial resources (restructure subsidies, integrate and abolish similar programs) Growth engine (food industry, etc.) Focus on current issues including complementary measures for the Korea-US FTA and supply and demand stabilization
2013	Strategic financial support

Source: Overview of Budget and Fund Scheme, each year, MIFAFF.

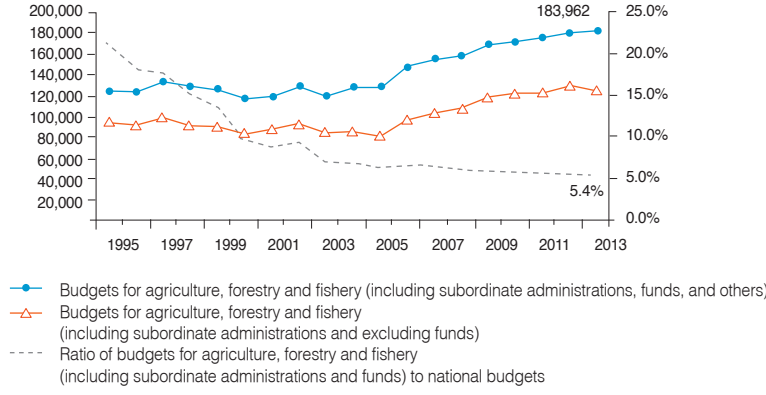
vibrant rural communities and happy people' and emphasized strategic support to achieve the goal. It is continuously emphasized on efficient financial execution to cope with expanded welfare policy and increasing demands for financial resources.

Changes in Agricultural Budget and Its Ratio to National Budget

The budget of the agriculture, forestry and food sectors (hereinafter agri-food sector) increased by 1.5 times from 12.5 trillion won in 1995 to 18.3 trillion won in 2013, including the subordinate administrations and funds. Although 12.4 trillion won in 2013 shows an increase in comparison with 9.4 trillion won in 1995 even

Figure 6-6 Ratio of Budgets for Agriculture, Forestry and Fishery Sectors to National Budgets by Year

Unit: 100 million won



Source: *Statistics of Agriculture, Forestry, Fishery and Food*, 2006-2012.
MIFAFF (MAFRA) Budget Overview, 1996-2013.

though the funds[3] are not included, the ratio to the total expenditure shows a drop from 15.9% to 3.6%. The budgets of MAFRA except the subordinate administrations[4] increased from 11.2 trillion won in 1995 to 13.5 trillion won in 2013 although the increase is not great. The proportion of the budgets for the agri-food sector is 5.4% of the national budgets as of 2013, falling 15.7 percentage points from 21.1% in 1995, and is on the decline.

As FTAs for the agricultural product market and increasing production costs worsen the condition of agricultural management, policy demands have increased and financial input into the

3) **Fund for Agricultural Price Stability, Fund for Livestock Farming Development, Fund for Farmland Management,** Fund for Compensating for Income Loss from Rice Farming, FTA Implementation Fund, Crop Disaster Insurance Fund, Grain Bonds Settlement Fund, etc.

4) Rural Development Administration (RDA), Korea Forest Service

agricultural sector has continued to expand. To be prepared for the UR negotiation, the government executed the Structural Improvement Plan for Agricultural and Fishing Villages from 1992 and invested 82 trillion won (including 13 trillion from the local government budgets, and 10 trillion won paid by affected farmers and fishermen) from 1992 to 2002. The investment plan focused on building social overhead capital for agriculture including improving production infrastructures and distribution including the wholesale market, and modernizing facilities. For 10 years from 2004 to 2013, the government invested 119 trillion won into the vision for the society in urban-rural balance.

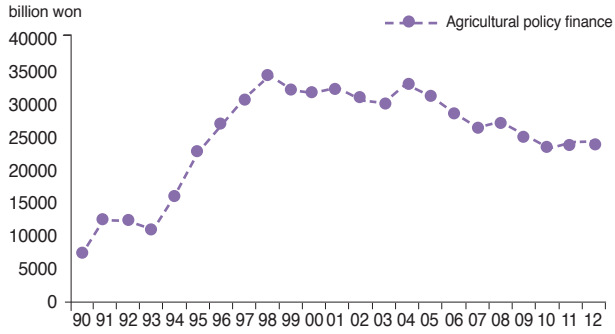
However, while financial investment and loans for the agricultural sector quickly expanded, inefficient use and distorted execution of the funds were criticized. As financial execution of the Korean government had trouble due to the currency crisis in late 1997, budgets for the agricultural sector were significantly reduced. The budgets for the agriculture and forestry sector showed a drop from the peak in 1995 and slight changes of 5-6% in the 2000s.

Current Agricultural Public Finance and its Role

The agricultural policy finance is divided into subsidies and loans depending on the scheme of government project funds, and policy finances include direct loans, interest make-up, credit guarantee, and investment.

The balance of agricultural policy funds decreased from 31.9 trillion won in 2001 to 23.2 trillion won in 2010, but gradually increased to 25.2 trillion won as of late 2013. The debt program was

Figure 6-7 Changes in Agricultural Policy Finance



Source: MAFRA data. "Current Status of Agricultural Policy Fund (Loans) Support."

used to change the debt caused by mutual finance into the policy finance of a long-term low interest rate to temporarily increase to 32.4 trillion won in 2004. However, in comparison with the 1990s, it seems that expansion of policy finance stopped in the 2000s. Except for the fund for solving debts, the policy funds dropped from 21.8 trillion won in 2001 to 17.3 trillion won in 2007, but slowly increased to 23.2 trillion won as of late 2013.

Newly supplied agricultural policy funds decreased from 10.6 trillion won in 2001 to 7.2 trillion won in 2007, and are now approximately 9.3 trillion won. Except for the fund for solving debts, the funds decreased from 9.8 trillion won in 2001 to 5.8 trillion won in 2005, and increased to 9.3 trillion won in 2013 because there is almost no new debt program recently.

In the policy finance, the government funds account for 47.9% as of late 2013, and the balance of private fund loans of which the interest is subsidized by the government is more than 52%. The

financial resources for special accounts, including the funds for the agriculture & fisheries structure adjustment special account and the special accounts for treasury loans, account for just 9.7% in the government funds, and the funds for agricultural product price stability, farmland, development of livestock farming and FTAs increased to 38.2%. In particular, many of the agricultural stability and farmland funds are used for loan programs. While the debt program by private funds accounts for just 15%, most of the funds are from the National Agricultural Cooperative Federation (96.9%), and the funds from the National Forestry Cooperative Federation and commercial banks are included.

The financial resources, a component of the entire loan balance, show the proportion of special accounts gradually lowered in the 2000s, and funds have a high portion. The fund of which the financial resources are for special accounts decreased from 9.9 trillion won in 2001 to 2.4 trillion won in 2013, with a proportion decrease from 31% to 9.7%. Funds increased from 6.5 trillion won in 2001 to 9.6 trillion won, with a proportion increase from 20.6% to 38.2%.

The guarantee scale of the Agriculture, Forestry and Fisheries Credit Guarantee Fund is 9 trillion 427.5 billion won based on the balance in 2013 with 570,000 cases, and the new guarantee amount in 2013 is 4 trillion 302.5 billion won with 170,000 cases, approximately 27.1% of the entire policy finance. The guarantee part of the agricultural sector increased to account for almost 40% in the policy finance in the early 2000s, but tended to drop and is increasing again after 2010.

The policy finance for the agricultural sector has been a source of funds required for investment in agricultural development, that

Table 6-12 Changes in Agricultural Policy Finance Scale

Unit: 100 million won, %

	2001	2005	2011	2012	2013
Loan	319,088	308,615	236,946	237,169	252,464
Guarantee (percentage)	186,066 (36.8)	178,088 (36.6)	85,615 (26.5)	86,895 (26.8)	94,275 (27.2)
Total	505,154	486,703	322,561	324,064	346,739

Source: Agricultural Financial Policy Division, MAFRA; Agriculture, Forestry and Fisheries Credit Guarantee Fund.

is, new investment in expanding farming scales including investment in facilities, purchasing farmland, and scaling up livestock farming. For the financial industry of Korea, the function of policy instruments for supporting the real economy has been emphasized. In the agricultural sector, finance's role of supporting the real economy is stressed, including supplementing market failure and supporting economic development. Therefore, it is vital to support agricultural finance in order to maintain and expand the base for agricultural growth by compensating for slow agricultural growth and lowered agricultural profitability due to the implementation of FTAs.

4. The Current Status and Policy of Agro-food R&D

Current Status of R&D Investment in Agri-food

R&D investment in the agri-food sector is carried out mainly by three organizations: the Ministry of Agriculture, Food and Rural Affairs (MAFRA); the Rural Development Administration (RDA); and the Korea Forest Service (KFS). The R&D budget of these three organizations for the year of 2014 is 893.4 billion won in aggregate. While the total budget for agri-food (including budget for the Rural Development Administration and the Korea Forest Service) increased by 2.7% on yearly average for seven consecutive years from 2008 to

Table 6-13 Share of R&D Budget of Ministry of Agriculture, Food and Rural Affairs, Rural Development Administration, and Korea Forest Service

Unit: 100 million won

Classification	2008	2009	2010	2011	2012	2013	2014	Average annual increase rate
R&D budget of MAFRA, RDA, and KFS (A)	5,709	6,257	6,699	7,463	7,983	8,439	8,934	7.7
National R&D budget (B)	110,784	123,437	137,014	148,902	160,244	171,471	177,428	8.2
Total expense of MAFRA, RDA, and KFS (C)	142,756	151,434	155,040	159,584	163,454	164,443	167,256	2.7
A/B (%)	5.2	5.1	4.9	5.0	5.0	4.9	5.0	-
A/C (%)	4.0	4.1	4.3	4.7	4.9	5.1	5.3	-

Source: Ministry of Agriculture, Food and Rural Affairs (2013). National Science & Technology Information Service (www.ntis.go.kr).

2014, the budget for R&D expanded by 7.7% over the same period. As a result, the ratio of R&D budget to the total budget for agri-food also increased from 4.0% in 2008 to 5.3% in 2014, showing the greater importance of R&D in agri-food policies. However, the level of R&D investment for the agri-food sector is still lower than that of other sectors carried out by departments including the Ministry of Trade, Industry and Energy.

R&D investment in agri-food has been made mainly by the public sector, rather than by the private sector compared to R&D investment in other areas. As of 2012, the total domestic R&D investment including the private sector's investment is approximately 55.45 trillion won and the R&D investment in the food, agriculture and forestry sector[1] accounts for 2.3% (1.25 trillion won)[2]. The R&D expenditure in the agri-food sector by the private sector (private enterprises) was 424.9 billion won (33.9%), and its share was smaller than that of R&D expenditure of 540.8 billion won (43.2%) by public research institutes[3]. It is much lower than the share of R&D expenditure by private enterprises (77.9%) in the total R&D expenditure of the nation in 2012 (43.2 trillion won in the total 55.4 trillion won). As the R&D expenditure in the agri-food sector by the private sector included that in the food industry, the R&D expenditure by private enterprises included in the agricultural,

1) This sector is categorized as the agricultural industry for its socio-economic purposes. (Korea Institute of S&T Evaluation and Planning and the Ministry of Science, ICT and Future Planning, *2012 Survey of Research and Development in Korea*, 2013.)

2) Korea Institute of S&T Evaluation and Planning and the Ministry of Science, ICT and Future Planning, *2012 Survey of Research and Development in Korea*, 2013.

3) Public research institutes include national research institutes, government-contributed research institutes, nonprofit research institutes, national or public hospitals, and private hospitals (Korea Institute of S&T Evaluation and Planning and the Ministry of Science, ICT and Future Planning, *2012 Survey of Research and Development in Korea*, 2013.) Universities disburse the rest 22.9% in the total expenditure.

Table 6-14 Changes in Agricultural R&D Investment by Seven Major Sectors

Unit: 100 million won, %

Classification	2009		2010		2011		2012		Average yearly increase rate
	Invested amount	Share	Invested amount	Share	Invested amount	Share	Invested amount	Share	
Production system	972	13.7	984	12.7	934	10.8	698	7.7	-10.5
Resource/environment/ ecological base	724	10.2	1,075	13.9	926	10.7	868	9.6	6.2
Production/processing	1,440	20.3	1,920	24.9	1,674	19.4	1,628	17.9	4.2
Distribution/food product	451	6.4	868	11.2	637	7.4	684	7.5	14.9
Bio	457	6.5	750	9.7	823	9.6	982	10.8	29.0
IBNT convergence	316	4.5	117	1.5	175	2.0	284	3.1	-3.5
Culture	101	1.4	105	1.4	117	1.4	100	1.1	-0.3
Others	2,624	37.0	1,900	24.6	3,329	38.6	3,841	42.3	13.5
Total	7,084	100.0	7,720	100.0	8,615	100.0	9,085	100.0	8.6

Note: The amount includes investment in fishery products.
Source: Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry & Fisheries. (2012; 2013a)

forestry and fishing industries was a mere 26.6 billion won in 2012.

The current status of national R&D investment in the agri-food sector in terms of seven related sectors in the First Comprehensive Plan reveals that the biotechnology sector, of which investment has been expanded most between 2009 and 2012, increased by 29% on yearly average. However, the production system sector which produces seeds and agricultural materials contracted by 10.5%. Meanwhile, R&D investment in the distribution and food sector increased by 14.9% over the same period.

Korea's Agri-food R&D System and Its Agents

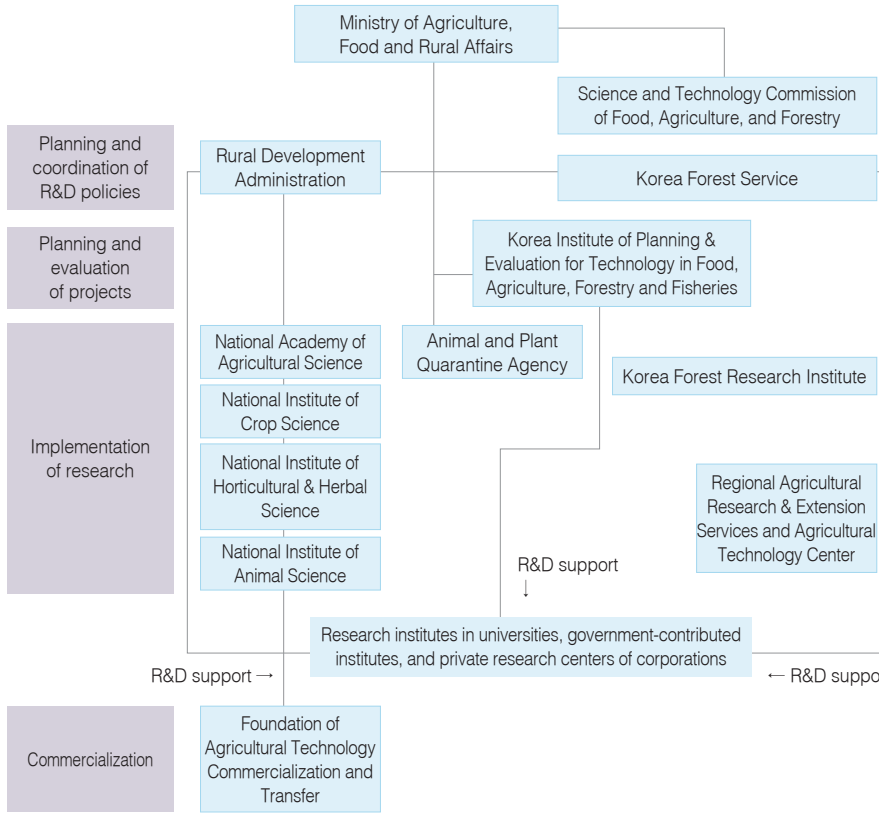
The R&D system of Korean agri-food is summarized as the figure below.

The Science and Technology Commission of Food, Agriculture, and Forestry (STCFAF), established in accordance with the Act on Promotion of Science and Technology in Food, Agriculture, Forestry and Fisheries, is the highest governing body that evaluates development and support policies and investment direction for advance in technology of food, agriculture, and forestry, and coordinates R&D projects carried out by three organizations (Ministry of Agriculture, Food and Rural Affairs, Rural Development Administration and Korea Forest Service).

The STCFAF conducts a variety of tasks: managing directions of agri-food R&D projects of the three government organizations; establishing comprehensive plans, action plans, and major policies for technology development in food, agriculture, and forestry; evaluating budget and investment; examining performance of major R&D projects through evaluation of unit projects and technology; and establishing a network among experts in the food, agriculture, and forestry areas and those in other sectors to secure diversity in agri-food R&D projects.

The Ministry of Agriculture, Food and Rural Affairs (MAFRA) is responsible for general management of R&D policies in the agri-food sector and the Animal and Plant Quarantine Agency under the MAFRA implements R&D projects. The Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry and Fisheries (iPET), established in accordance with the Act on Promotion of Science and Technology in Food, Agriculture, Forestry and

Figure 6-8 Agri-food R&D System



Source: Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry and Fisheries (http://www.ipet.re.kr/Policy/Propel.asp). The content was partially complemented.

Fisheries, is also under the MAFRA. The R&D projects of the MAFRA are carried out by university research institutes, government-contributed research centers, or corporate or private research institutes under the supervision of the iPET.

Major tasks of the iPET include supporting the establishment of comprehensive plans and action plans to promote technology advance in food, agriculture, and forestry; supporting the planning, management, and evaluation of R&D projects; examining technological capabilities in the food, agriculture, forestry, and fishery sectors; and providing support for nurturing human resources in the related fields.

The Rural Development Administration (RDA) is in charge of planning and managing R&D projects within the RDA, and has various research institutes including the National Academy of Agricultural Science, the National Institute of Crop Science, the National Institute of Horticultural & Herbal Science, and the National Institute of Animal Science. In addition, based on the Rural Development Act, the RDA established and has operated the Foundation of Agricultural Technology Commercialization and Transfer (FACT) in order to commercialize R&D results. The FACT is responsible for facilitating technology transactions; creating the foundation for commercializing R&D achievements in the agri-food sector; and providing test and certification.

For the forest sector, the Korea Forest Service manages R&D projects, and has the Korea Forest Research Institute that implements various R&D projects.

Other regional research institutes include the Provincial Agricultural Research & Extension Services, their plant experiment stations, and Agricultural Technology Centers in each metropolitan city, city, and county, carrying out R&D projects for on-site application and development and spreading developed technologies.

Table 6-15 R&D Organizations and Roles

Organization		Roles
Ministry of Agriculture, Food and Rural Affairs		Establishing and implementing general agri-food policies and R&D (technology) policies
Science and Technology Commission of Food, Agriculture, and Forestry		Establishing policies to advance technology in food, agriculture, and forestry; evaluating and coordinating comprehensive plans and action plans, budget investment directions, and the project performance and management
Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry and Fisheries		Establishing comprehensive plans to advance science and technology in the agri-food sector; providing support to develop policies; planning, managing and evaluating R&D projects under the Ministry of Agriculture, Food and Rural Affairs
Rural Development Administration Korea Forest Service		Being responsible for R&D (technology) policies of the RDA and the KFS and implementing projects for developing rural and mountain villages
Research institutes	National and public research centers under the RDA	▪ National Academy of Agricultural Science ▪ National Institute of Crop Science ▪ National Institute of Horticultural & Herbal Science ▪ National Institute of Animal Science
	National and public research centers under the KFS	▪ Korea National Arboretum ▪ Korea Forest Seed and Variety Center ▪ Korea Forest Research Institute
Regional research institutes		Agricultural Research and Extension Services and Agricultural Technology Centers are responsible for implementing R&D projects for on-site application/development
		▪ Provincial Agricultural Research & Extension Services: Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam provinces, and Jeju special self-governing province
		▪ Agricultural Technology Centers in metropolitan cities: Seoul, Incheon, Ulsan, Gwangju, Daegu, Daejeon, and Busan
		▪ Agricultural Technology Centers in cities and counties: Incheon (3), Daegu (1), Busan (1), Gangwon (15), Gyeonggi (23), Gyeongnam (23), Gyeongbuk (31), Jeonnam (21), Jeongbuk (13), Chungnam (20), Chungbuk (12), Jeju (3)
		▪ Plant Experiment Stations affiliated with the Provincial Agricultural Research & Extension Services: Gyeonggi (3), Gangwon (4), Chungbuk (4), Chungnam (6), Jeonbuk (4), Jeonnam (4), Gyeongbuk (9), Gyeongnam (4)
Foundation of Agricultural Technology Commercialization and Transfer		Facilitating commercialization and industrialization of R&D achievements in the agricultural science and technology sector

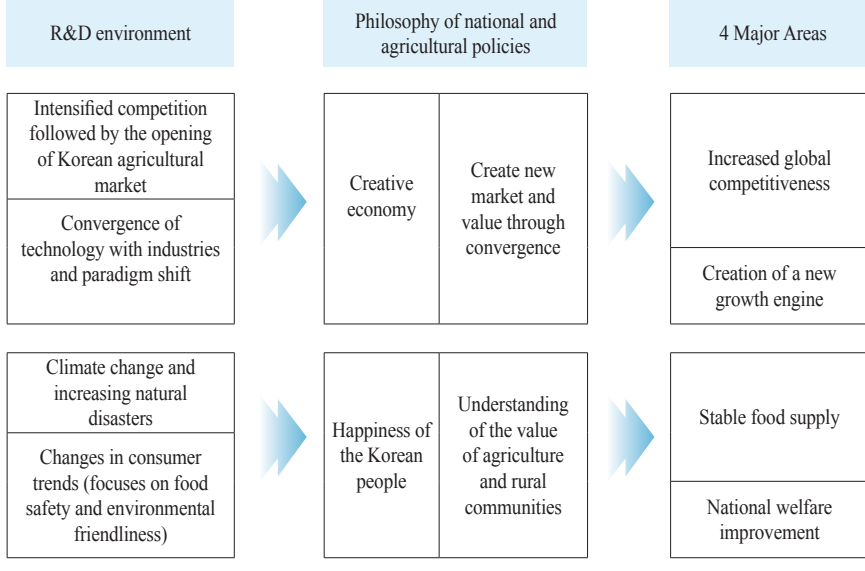
Source: Kim Hanho et al. (2013), complemented. (Original source: *Research Outlook for Innovation Systems of Agricultural Technology in Foreign Countries*, Rural Development Administration, 2010)

R&D Focus and Core Technologies

In 2013, the Ministry of Agriculture, Food and Rural Affairs, the Rural Development Administration, and the Korea Forest Service announced the "Mid- and Long-Term Plan for Agri-food Science & Technology Development (2013-2022)" with four major R&D areas of increasing global competitiveness, creating a new growth engine, stably supplying food, and improving national welfare. The plan reflected the R&D environment such as the opening of the Korean agricultural market and climate change; and philosophy of the Korean agricultural policies including a creative economy and greater happiness of the Korean people.

Reinforcement of Global Industrial Competitiveness

Reinforcement of global industrial competitiveness is to be carried out to raise competitiveness through nurturing a technology-



intensive agri-food industry and to create higher value through technological innovation including convergence with ICT.

● Performance Targets

• Agri-food Exports Increase: $5.6 billion in 2012 → $10 billion in 2017 → $15 billion in 2022

• Added Value: ₩56 trillion in 2012→ ₩67 trillion in 2017 → ₩77 trillion in 2022

To this end, investment will be focused on developing technologies that strengthen the industrial competitiveness to respond to the opening of the Korean agricultural market following the 45 FTAs as of 2013, technologies that raise the global competitiveness and promote health of the public through connecting the agricultural and livestock industry with the food

Table 6-16 Core Technologies for Reinforcement of Global Industrial Competitiveness

Classification	Core Technologies
Response to FTAs	Eco-friendly, integrated livestock waste treatment technology
	Advanced, eco-friendly livestock shed development for animal welfare
	Technology for improving livestock product quality and productivity
	Storage and distribution technology for fresh agricultural and livestock products
	Cultivation of new high-quality horticultural varieties to respond to royalty and for export
	Technology that commercializes advanced horticultural apparatus with high-performance
	Management cost reduction and productivity improvement technology for facility horticulture
High value-added food	High value-added beneficial food development technology
	Commercialization technology for high-quality/high-income fermented foods
	Freezing and defrosting technology for agri-food freshness maintenance and long-term storage
	Integrated production management system for food processing efficiency improvement

ICT convergence	Robot-based technology for agricultural and livestock products
	Technology for state-of-the-art intelligent precision agriculture
	Commercialization technology for eco-friendly and smart (fully controlled) plant factories
	Integrated intelligent control system for agricultural irrigation

industry, and technologies that are intellectualized, automated, and converged with ICT to address the problems caused by decreasing rural population and increasing agricultural management costs.

Creation of a New Growth Engine

Efforts to create a new growth engine will be made in order to create new markets by nurturing the high-quality and eco-friendly agricultural life industry and new material industry, and to become an energy powerhouse through developing and industrializing energy created in the agricultural sector.

To this end, the government implements the establishment of a system which provides comprehensive technology supports throughout the entire cycle from source technology to application and development technology, thereby helping to promote the agricultural and bio-industry that includes agricultural genome, new biological materials and bio-food and drug. The government

● Performance Targets

• Domestic production in the new biological material industry:

₩10 trillion in 2012 → ₩15 trillion in 2017 → ₩20 trillion in 2022 (100% ↑)

• Renewable energy:

73,000 TOE in 2012 → 618,000 TOE in 2017 → 1,163,000 TOE in 2022 (1,493% ↑)

· Share of biomass in the total energy production: 10% in 2022

Table 6-17 Core Technologies for Creation of a New Growth Engine

Classification	Core technologies
Agricultural & new biological materials	Technology for antibiotic-reducing natural alternative materials development
	Environmentally harmful element-free bio-plastics
	Beneficial amino acid materials development and mass production
	Eco-friendly new materials development from wood resources
	Customized digestion-improving natural materials development
Agricultural & biological food and medicine	Materials development for food and medicines from agricultural & biological resources
	Development and commercialization technology for animal bio xeno-transplantation
	Mass production and control technology of animal protein for food and medicine
Agricultural & biological genome	R&D technology for agricultural genome information service
	Investigation and utilization study of useful gene characteristics
Golden Seed Project	Development of excellent seeds for strategic exports and alternatives to imports
	Highly efficient seed production and processing system for seed commercialization
Agriculture and rural village energy	Mass production technology for bio resource crops
	Highly efficient production technology for bioenergy
	Technology to use wood bioenergy and wood elements

supports to create a system for development and mass production of seeds for exports through the “Golden Seed Project.” In addition, in order to respond to future energy crisis including depletion of fossil fuels, the government promotes biomass mass production technology development and bio-energy production system construction.

Stable Food Supply

In order to achieve stable food supply, a sustainable agricultural industry resistant to climate change will be materialized and a foundation for safe livestock production will be prepared through establishing a thorough livestock disease quarantine system.

- Performance Targets
  - Reduction in greenhouse gas emissions: 0% in 2012 → 7.1 % in 2022
  - Securement of a position as an infectious livestock disease-free nation

To this end, the government is focusing on investing in the development of technologies that would enhance productivity and the quality of rice, upland crops, and roughage, addressing issues such as the instability of supply and demand for crops and the

Table 6-18 Core Technologies for Stable Food Supply

Classification	Core technologies
Improving the grain self-sufficiency rate	Development of staple grain varieties with high quality and productivity and technology for improving stable production
	Technology to improve productivity of field crops
	Technology for mass production of functional forage with high-productivity
Response to climate change	Development of climate change-adapted varieties and of their production technology
	High-tech, real-time climate disaster prediction system for agriculture and forestry
	Technologies to establish the foundation for predicting and assessing the impact of climate change for the agricultural, forest, and livestock sectors
Prevention from disaster and disease	BIT-converged, rapid diagnosis technology for disease and pest
	Epidemiologic investigation technology for agriculture, forest, and livestock disease
	Technology for prevention and treatment of livestock disease including communicable disease between men and beasts
	Establishment of an internationally integrated quarantine system for agricultural, forest, and livestock disease

weaponization of food resources. In addition, the government tries to develop technologies that address issues such as decreasing crop production and changes in suitable farmland, induced by climate change and global warming. The government also tries to develop technologies to establish a system for prevention and treatment of new or variant types of livestock diseases which threaten the foundation of the livestock industry and health of the people.

National Welfare Improvement

The targets of the national welfare improvement area are to reinvent rural and mountain regions into vibrant working and resting places through value-improvement of those regions, to promote urban farming where animals, plants, humans, and natural settings co-exist, and to establish the foundation for production and management of safe agri-food, with a level befitting Korea's status of G7.

● Performance Targets

- Rural residents' satisfaction level for the quality of life: 50 points out of 100 in 2012 → 60 points in 2017 → 65 points in 2022 (30% ↑)
- The number of beneficiaries of forest welfare services: 11 million in 2012 → 20 million in 2017 → 30 million in 2022 (172% ↑)
- Construction of urban forests in living zones: 8㎡ per person in 2012 → 9㎡ in 2017 → 10㎡ by 2022 (25% ↑)
- Agricultural/livestock produce with environmentally friendly certification: 7%/12% in 2012 → 9.5%/15% → 12%/20% in 2022

To this end, the government is pushing ahead with developing technologies that help increase non-farm incomes by preserving traditions of rural communities while turning them into tourism assets, technologies that help enhance urban dwellers' understanding of the agricultural industry, and technologies that help improve the urban environment and landscape. Efforts will be made to develop technologies that help raise the value of forest and establish forest welfare services including relaxation and healing programs in forest. In addition, efforts will be intensified to establish a production system for agri-food in order to enhance health of the people and to provide safe food.

Table 6-19 Core Technologies for Improvement of National Welfare

Classification	Core technologies
Value improvement of agriculture and rural villages	Technology for preservation of rural landscape and traditional resources and for cultural content production
	Safety management technology for farmers
	Technology for establishing a green town utilizing urban greening technology
	Technology for supporting agriculture settlement for people returning to farms
Forest management advancement	R&D technology for forest welfare services
	High value-added forest resource creation and cultivation technology
	New variety development and cultivation technology for forestry income sources
Safe food production	Technology for safe agri-food production and hazard control
	Technology for establishing a life-cycle livestock product safety control system
	Technology for product safety investigation and quality control at the agri-food production stage

Major R&D Policies for Agri-food

Achievements of R&D investment in the agri-food sector are as follows.

First, increased investment in agri-food R&D contributed to enhancing the level of technologies in the sector. As mentioned above, while the total budget for the agri-food sector (including RDA and KFS) increased by 2.7% for the recent seven years (2008-2014), the budget for R&D expanded by 7.7% on yearly average over the same period, raising the share of R&D in the overall policies in the related sector. As a result, Korea's relative technology level to the country of highest level, once 67.4% as of 2009, was heightened by 8% points to 75.4% in 2012. In addition, years of technology gap were narrowed by 0.9 years from 6.1 years in 2009 to 5.2 years in 2012.

Second, the groundwork for increasing efficiency of R&D has been created and related policies have been improved. For example, the coordination function for agri-food R&D policies has been intensified, while the information system was established. Various councils and special organizations such as the Science and Technology Commission of Food, Agriculture, and Forestry (established in April 2009), the Korea Institute of Planning & Evaluation for Technology in Food, Agriculture, Forestry and Fisheries (established in October 2009), and the Foundation of Agricultural Technology Commercialization and Transfer (established in September 2009) were created in order to improve inter-organizational coordination of policies, to manage and commercialize R&D achievements. The Office of Strategic R&D Planning for Climate Change was set up in 2011 and implemented joint surveys on demand for technology, laying the groundwork for

enhanced efficiency of R&D. In 2012, the unified service system was prepared for integrated management of agri-food R&D information by establishing the Food, Agriculture, Forestry and Fisheries R&D Information Service (FRIS).

Third, a system for commercializing technology was created throughout the whole stages from a R&D commencement and intellectual property protection acquisition stage to a technology transfer and trade stage, to a market entry and maturity stage. The private investment environment for R&D by agri-food companies was created by expanding projects to commercialize technology[4] and by introducing the "R&D fund." Early commercialization of technologies was achieved through expanding opportunities for private enterprises to participate in R&D projects carried out by the government. The participation rate of private companies in the national R&D projects for agri-food areas increased from 25% in 2012 to 32% in 2013.

The certification system for new technology was introduced to create the bases to enter into the market in an early stage by raising credibility of the products in which new technology is applied. Products or companies with new technology certification are provided with various government supports including funds for commercializing excellent technology, purchase of products with new technology by public organizations and public enterprises, and the granting of additional points in case those companies participate in the agri-food R&D projects organized by the government.

Despite these achievements, a number of problems exist in

4) Budget for commercialization of agri-food (as of 2013): the technology commercialization project (iPET 7.2 billion won), the agricultural technology commercialization project (FACT 4 billion won), etc.

the R&D of agri-food in Korea as follows: shortcomings in linkage between agri-food policies and R&D; limitation of the Science and Technology Commission of Food, Agriculture, and Forestry as a control tower that leads innovations in agri-food science and technology; limited investment of private organizations and companies in R&D; the weak regional base for R&D; insufficient research for convergence with ICT, BT, and NT; and unsatisfactory level of and immature conditions for commercialization of technologies.

In order to overcome these issues in the R&D of agri-food and related policies and to maximize the achievements, the government has been implementing or is expected to implement the following policies.

First, policy establishment and coordination functions of the Science and Technology Commission of Food, Agriculture, and Forestry should be intensified to play a role of a control tower that leads the overall R&D policies in the food, agriculture, and forestry sectors. In particular, functions of special commissions should be readjusted by the four core areas in the agri-food sector, strengthening policy supports through searching for agendas, preparing planning reports, and holding forums and workshops.

Second, governance based on convergence among various departments and organizations should be established. To this end, inter-organizational convergence research is to be expanded in order to converge agriculture and forestry with IT and BT, and an inter-organizational joint office for planning is to be established and operated to facilitate inter-organizational convergence research. In addition, cooperation among the Rural Development Administration,

the Animal and Plant Quarantine Agency, the Korea Forest Research Institute, and research institutes of other areas should be strengthened.

Third, regional R&D should be activated. To this end, an integrated R&D support system, which intensifies R&D cooperation and linkage between the central and local governments, should be established. Based on special items of the local areas, the sixth industrialization should be carried out by converging the primary, secondary, and tertiary industries in order to vitalize the regional economy. In addition, infrastructures for enhancing regional R&D capabilities should be provided while central-local joint research is expanded.

Fourth, a competitive and open system is intensified. Expansion in quality and quantity of R&D manpower in the private sector should be implemented through expanding support projects for research centers for food, agriculture, and forestry, and through vitalizing collaboration among industries, academia, and research centers, carried out mainly by SMEs. In addition, a center for employment of R&D human resources, which links R&D manpower in the agri-food sector with corporate demands, is needed.

Fifth, private investment in R&D should be increased. To this end, functions of producer groups such as agricultural and livestock cooperatives should be expanded from production and distribution functions including controlling supply and demand and facilitating consumption to R&D functions. In addition, agri-food venture businesses based on technologies are to be nurtured in order to increase R&D of agri-food SMEs. A technology finance system which supports funds for commercializing agri-food related technologies

on security of technological values should be promoted.

Sixth, commercialization of technologies should be strengthened. To this end, business incubation centers for agriculture and convergence of farmers, manufacturers, and tradesmen should be expanded to contribute to the vitalization of the agri-food sector. In addition, the foundation for the market entry of excellent technologies is to be prepared. For example, a new agri-food technology certification system can be introduced. At the same time, financial support (loans) for commercializing excellent technologies should be increased based on the assessment of the technological value, and world-class education institutes such as Gyeongnam Agricultural Technology Education Center must be expanded.

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5. Environment-Friendly Agriculture and Climate Change

Background for Implementing Environmentally Friendly Agriculture

Agriculture, an industry that utilizes and manages natural resources, has a positive or negative impact on the environment depending on farming practices and how to manage environmental resources. Environmental load from the agricultural sector has continued to increase as Korea pursued intensive agriculture with high input and output because of the nation's limited land and of the national goals to increase food self-sufficiency for the country's high population and to increase farm household incomes. As the environmental issues including water pollution and soil deterioration due to increasing intensive agricultural production activities became serious in Korea, the Environmentally Friendly Agriculture Division was created in December 1994 within the Ministry of Agriculture and Forestry in order to pursue the harmony between agriculture and the environment. The "Agro-Environmental Policy towards the 21st Century," a blueprint for environmentally friendly agriculture in Korea, was adopted in 1996, and the institutional foundation was prepared in 1997 with the enactment of the "Environment-Friendly Agriculture Promotion Act." "Environmentally friendly agriculture" is defined in Korea as a sustainable agriculture that pursues harmony between agriculture and nature, which produces safe agricultural and livestock products, while preserving the environment of the agricultural ecosystem through 1) non-use or minimal use of chemical materials including pesticides, chemical

fertilizers, antibiotics and antibacterial agents and 2) recycling of agricultural and livestock by-products. In other words, environment-friendly agriculture is an industry that pursues profitability in agricultural production, preservation of the ecosystem, and the safety of agricultural products altogether. The promotion plans for environment-friendly agriculture are significant in Korea's agricultural policies as they function as the baseline for converting conventional agriculture into sustainable one. Since the 2000s, the Ministry of Agriculture, Food and Rural Affairs has been active in creating and implementing a variety of policy programs in order to develop sound environmentally friendly agriculture.

Current Status of Environmentally Friendly Agriculture in Korea

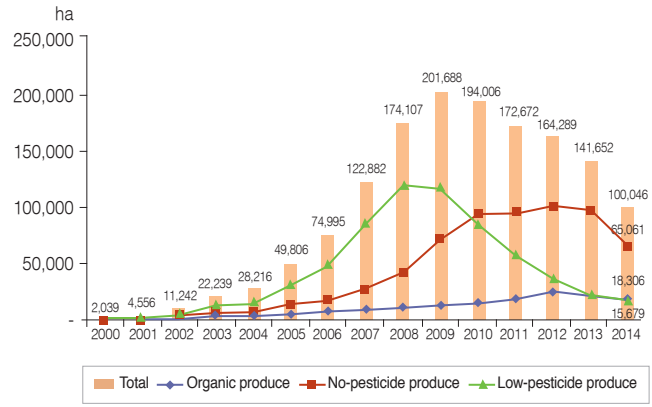
Current Status of Environmentally Friendly Agricultural Production

Until the early 1990s, private organizations led environmentally friendly agriculture. With the full-scale implementation of the promotion policies for environmentally friendly agriculture in the mid-1990s, the number of farming households whose products were certified as environmentally friendly produce has increased since 2000. Farmlands for environmentally friendly agriculture were 2,039 hectares in 2000, but have expanded by 30 percent every year to become 210,688 hectares in 2009. However, the cultivated area for environmentally friendly agricultural produce has been on the decline every year after the peak in 2009 when the Korean government stopped issuing any new certification for low

pesticide produce, recording 164,289 hectares in 2012, 141,652 hectares in 2013, and 100,046 hectares in 2014. As of 2014, the farmlands utilized for environmentally friendly agriculture account for 5.9 percent in the total farmland. By types of certification for environmentally friendly agricultural produce, organic cultivation took up 14.5 percent; no-pesticide cultivation, 43 percent; and low-pesticide cultivation, 42.5 percent in 2000, but no-pesticide cultivation increased significantly to 65 percent while low-pesticide cultivation decreased considerably to 16.7 percent, and organic cultivation inched up to 18.3 percent (Figure 6-9).

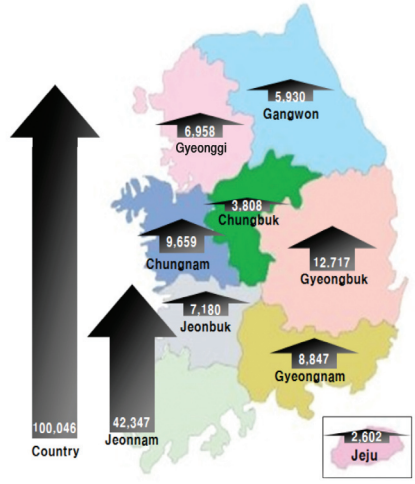
The level of practicing environmentally friendly farming is different from region to region in Korea (Figure 6-10). Data for each province's area of farmland certified as environmentally friendly agriculture demonstrate that Jeollanam-do was the highest with

Figure 6-9 Changes in Certified Areas for Cultivating Environmentally Friendly Produce



Source: Statistics for certification of environmentally friendly produce from the National Agricultural Products Quality Management Service, <http://www.enviagro.go.kr>.

Figure 6-10 Farmland Used for Environment-Friendly Agriculture by Regions (As of 2014)

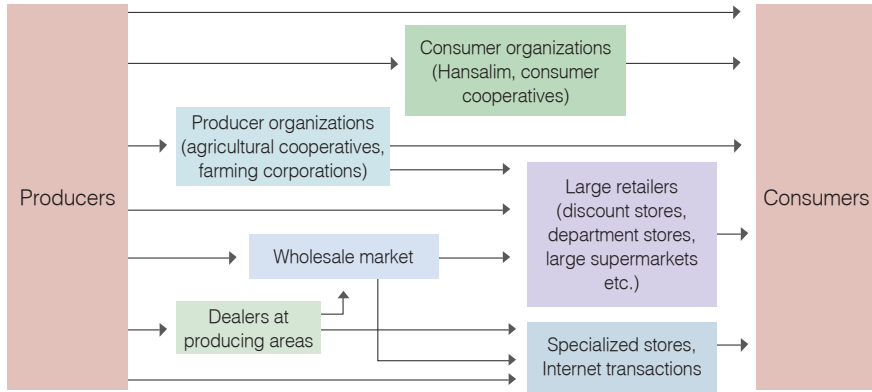


42,347 hectares of environmentally friendly farmland (42.3% of the total), followed by Gyeongsangbuk-do with 12,717 hectares (12.7%), Chungcheongnam-do with 9,659 hectares (9.7%), and Gyeongsangnam-do with 8,847 hectares (8.8%) (Figure 6-10). The area of farmland used for environmentally friendly agriculture varies greatly depending on each province's level of implementation of environmentally friendly agricultural policies.

Current Status of Distribution of Environmentally Friendly Agricultural Products

As production and demands for environmentally friendly agricultural produce expanded recently, various types of distribution channels have co-existed. Diverse sales channels have also been created as production and distribution of the produce go

Figure 6-11 Distribution Channels for Environmentally Friendly Agricultural Products



closely hand in hand for product differentiation. Sales channels of environment-friendly agricultural products can be classified into three categories: direct transaction between producers and consumers; transaction between producers' organizations (National Agricultural Cooperative Federation, environment-friendly agriculture organizations) and consumers' groups (Hansalim, consumer cooperatives, etc.); and sale to consumers at department stores and specialized stores after specialized distribution companies bought products from producers (Figure 6-11).

The component ratio for environmentally friendly certified produce by destination demonstrates that 5-10% of environment-friendly agricultural products are bought and sold through direct transactions, while 55-60% are purchased through producers' organizations and large retailers (including Hanaro club), 20-25% through consumers' organizations such as Hansalim and consumer cooperatives, and 20-25% through specialized stores and on the

Internet. Recently, the share of direct transactions and distribution through consumers' organizations has been on the decrease, while purchase at large retailers and through specialized distributors has increased substantially.

Market Size and Outlook for Environmentally Friendly Agricultural Products

It is difficult to figure out the exact market size of environmentally friendly agricultural products as the transaction volume varies drastically depending on an item and a certification level. Therefore, the market size was roughly calculated by applying assumptions to shipment volumes, percentage of distribution, and marketing margins of environmentally friendly agricultural products according to the certification level. As of 2014, the distribution scale of environment-friendly agricultural products is estimated to have contracted by 10.5% to 2.42 trillion won over the previous year, accounting for approximately 6% of the total agricultural product market. Grain is estimated to be 521 billion won (rice 488.8 billion won), vegetables 581.7 billion won, fruits 780 billion won, root and tuber crops 64.7 billion won, and special crops (mostly mushrooms) 474.7 billion won (Table 6-20).

On the supposition of 5.7% in shift to organic cultivation and 30.7% in shift to no-pesticide cultivation (Korea Rural Economic Institute, 2013 Survey results of farms practicing environmentally friendly agriculture), based on the current up-ward trend of consumption and abolition of low-pesticide certification in 2016, the market size for environment-friendly products is expected to continue to contract by 2.3% to 2.36 trillion won year on year in

Table 6-20 Market Size Estimates and Forecasts for Environmentally Friendly Agricultural Products (2013-2024)

Unit: billion won

	2013	2014	2015	2016	2017	2020	2024
Grains	775	1,068	1,086	1,191	1,483	1,494	2,131
Rice	722	1,013	1,028	1,124	1,387	1,380	1,969
Vegetables	839	985	1,001	1,095	1,344	1,380	1,969
Fruits	420	841	830	861	904	552	787
Root and tuber crops	114	114	119	137	197	237	338
Special crops and others	314	404	430	508	782	985	1,405
Total	2,462	3,412	3,465	3,791	4,710	4,648	6,628

Source: Korea Rural Economic Institute (2015).

2015, and to 1.87 trillion won in 2016. Thanks to the government's active implementation of promotion policies for environmentally friendly agriculture, it is expected to start to increase from 2017 to become 2.62 trillion won in 2017, 2.76 trillion won in 2020, and 4.37 trillion won (15% of the total agricultural product market) in 2024.

Major Policy Programs for Environmentally Friendly Agriculture

Five-year Promotion Plans for Environmentally Friendly Agriculture

In accordance with the Act on Promotion of Environmentally Friendly Agriculture and Fisheries and Management and Support for Organic Foods, the Korean government has set up policy goals, directions and established plans to reduce environmental pollution

and usage of chemical materials in order to promote environmentally friendly agriculture in the nation. The First Five-year Promotion Plan for Environmentally Friendly Agriculture was implemented from 2001 to 2005, and various programs were implemented by sectors such as production, distribution, consumption and institutions under the Second Five-year Plan from 2006 to 2010. The Third Five-year Plan (2011-2015) with a goal of "realizing environmentally friendly green industry with the Korean people" has been set up and implemented by establishing and carrying out seven strategic tasks: creating production bases; vitalizing distribution and consumption; vitalizing processing and agricultural material industries; developing agricultural technologies and nurturing professional manpower; promoting environmentally friendly livestock and forest industries; and establishing a management system for agricultural environmental resources. The Fourth Five-year Promotion Plan for Environmentally Friendly Agriculture (2016-2020) is slated to be announced in December 2015 after active discussions on production, marketing, consumption, processing, and resource management, and it is to be started from January 2016.

Foundation-building Project for Environmentally Friendly Agriculture

The foundation-building project for environment-friendly agriculture promotes growth of environmentally friendly agriculture through systematic management of agricultural activities such as production and distribution at grouped paddy fields or farmland, inducing lesser use of pesticides and chemical fertilizers, and lesser production costs. Producer groups who hope to create an

environmentally friendly agricultural region at their villages can apply for the project if 10 or more farm households participate with more than ten hectares of grouped farmlands. Subsidies of this project are used in a village unit to purchase production facilities and equipment of organic agricultural materials, distribution and processing facilities and equipments for environmentally friendly products, and education facilities and equipment for environmentally friendly agriculture. Subsidies are granted differentially between 100 million won and 3 billion won per business unit, according to the scale and conditions of the business. Support is comprised of central government financing (30%), regional government spending (50%), and self-payment (20%). As much as 446.5 billion won between 1999 and 2012, 60.5 billion won in 2013, 41.7 billion won in 2014, and 28 billion won in 2015 were injected. According to the evaluation of the foundation-building project for environmentally friendly agriculture, the project has contributed substantially to the expansion of farm households practicing environment-friendly agriculture and to the vitalization of the distribution of the produce.

Direct Payment System for Environmentally Friendly Agriculture

The direct payment system for environmentally friendly agriculture is aimed at fulfilling public functions of agriculture including environmental conservation, and spreading the environment-friendly agriculture by making up the difference of the production cost and decreased incomes at an early stage of environmentally friendly agriculture. The system has been carried out since 1999 to induce production of environment-friendly

agricultural products by increasing the number of farm households engaged in environmentally friendly agriculture. In accordance with the Environment-Friendly Agriculture Promotion Act, cooperative units or farmers whose produce are certified as environmentally friendly agricultural products are eligible for the direct payment, which is made for three to five years (3-5 times if the farming is discontinuous). The direct payment is made differentially depending on the certification level and on whether the farmlands are rice paddies or fields, and the land limit per household is between 0.1 to 5.0 hectares. As of 2015, the unit price for direct payment per hectare for fields is 1.2 million won for organic cultivation, 1 million won for no-pesticide cultivation, and 524,000 won for low-pesticide cultivation. And the unit price for direct payment per hectare for rice paddies is 600,000 won for organic cultivation, 400,000 won for no-pesticide cultivation, and 217,000 won for low-pesticide cultivation. For reference, the unit price of the fixed direct payment in the rice income direct payment system is 1.07 million won per hectare for agricultural development regions and 807,312 won for regions other than agricultural development regions. The direct payment for continuous organic production, a subsidy for additional three years for farmland that has received the direct payment for maximum five years in recognition of organic production, has been implemented and its unit price per hectare is 300,000 won for rice paddies and 600,000 won for fields. The total amount of the direct payment for environmentally friendly agriculture paid was 264.6 billion won between 1999 and 2012, 37.6 billion won in 2013, 26.9 billion won in 2014, and 32.8 billion won in 2015.

Organic Fertilizer Assistance Program

The organic fertilizer assistance project aims at establishing an eco-friendly agricultural system that recycles resources and conserves farmland soil by reducing the inputs of chemical fertilizers and by transforming livestock by-products into resources. Among those who utilize by-product fertilizers (organic fertilizers, decomposed organic manure, etc.) and registered information on farming management are entitled to the assistance, farm households whose produce is certified as environmentally friendly produce, farm households in environmentally friendly complexes, and farm households participating in the project to promote collective paddy management entities are eligible for the project. Three kinds of organic fertilizers (mixed oil cake fertilizers, mixed organic fertilizers, organic composite fertilizers) and two kinds of decomposed organic fertilizers (livestock manure and general compost) are provided in this program. State subsidies are given at a flat rate, and they are, per burlap bag of 20 kilograms, 1,400 won for organic fertilizers. For decomposed organic fertilizers, 1,300 won for superior-class, 1,000 won for first-class, and 700 won for second-class are provided. The regional subsidies are 600 won per burlap bag of 20 kilograms, and additional subsidies can be given depending on financial conditions of local governments. As much as 161.3 billion won in 2013, 160.3 billion won in 2014, and 160 billion won in 2015 were injected in this project.

Soil Ameliorant Assistance Project

The soil ameliorant assistance project aims at improving acid soil and maintaining soil fertility by putting soil ameliorants (lime

and silicic acid) into farmlands with low content of available silicate, ultimately contributing to laying the foundation for environmentally friendly agriculture in Korea. Soil improvement is important in establishing the base for sustainable farming as the country rock of Korea is acid and dependence on chemical fertilizers is very high, resulting in acceleration of acidification of the Korean soil. This project has been implemented since the 1960s in accordance with Article 21 (Improvement and Preservation of Soil) of the Farmland Act, and Article 24 (the Enforcement of Projects for Soil Improvement and Maintenance) of the Enforcement Ordinance of the Act. Farm households in the nation engaged in cultivation can apply for this assistance project when their farmland falls into the following categories: rice paddies with available silicate content less than 157ppm; fields with volcanic ash soil; acid fields with less than pH 6.5 soil acidity (including orchards); and farmland polluted with heavy metals. The assistance is composed of state subsidies (70 percent) and regional subsidies (30 percent). The total state finance injected into this project was 89.9 billion won in 2013, 91.4 billion won in 2014, and 91.7 billion won in 2015.

Organic Agro-material Assistance Project

The organic agro-material assistance project provides agro-material and its base material used for organic agriculture including seeds of green manure crops, natural enemies for harmful insects, and microorganism products. In particular, the assistance program for seeds of green manure crops aims to improve soil fertility through increasing soil organic matter by raising green manure crops in unused farmland in order to maintain and preserve the

agricultural environment. Green manure crops are crops of which stems or leaves can be used as alternatives to fertilizers with effects of free nitrogen fixation, and hairy vetch, green barley, rye, and rattail fescue (exclusively in Jeju Special Self-Governing Province) are classified as those crops. With a goal of expanding content of organic matter in farmland from 2.5% in 2009 to 3.0%, the government has been actively carrying out related policies. Farmers who want to cultivate green manure crops in their unused farmlands, and those (including farming association corporations) who cultivate crops certified as organic and no-pesticide cultivation and want to use agro-material for organic agriculture including microorganism products and its raw materials are eligible for the assistance program. The assistance is composed of central government subsidies (50%) and regional government assistance (50%). A total of 15 billion won in 2013, 17 billion won in 2014, and 17 billion won in 2015 were injected in this project.

Projects for Vitalization of Distribution and Consumption of Environmentally Friendly Agricultural Products

The diverse projects for vitalizing distribution and consumption of environmentally friendly agricultural products have been carried out in order to secure stable sales channels and to induce appropriate prices of environment-friendly agricultural products. Among the projects are: supporting specialized distribution companies for funds for direct transactions; and supporting direct sales stores and settlement funds for environmentally friendly distribution centers. Farming association corporations and consumers' cooperatives that plan to start direct transactions

business for environment-friendly products, and those engaging in e-commerce are eligible for the assistance program that supports funds for direct transactions. The assistance is comprised of state loans (80%) and self-payment (20%). The Project for Vitalizing Distribution at Consumption Sites (loans) provides financial support for specialized stores for environmentally friendly products to heighten accessibility of consumers. Corporations with over 50 producer members and over 1,000 consumer members which operate specialized stores for environmentally friendly products with yearly sales of more than 1 billion won are eligible for this project. As much as 71.9 billion won in 2013, 51.4 billion won in 2014, and 51.5 billion won in 2015 were injected in this project.

Besides, in order to secure large-scale consumption sites for environment-friendly products and to advance effectiveness of distribution of them through stronger linkage between producing sites and consumption sites, a number of MOUs have been signed among the Ministry of Agriculture, Food and Rural Affairs (MAFRA), agricultural organizations for environmentally friendly farming, and large retailers. In addition, the government tries to transform existing Agricultural Processing Centers (APCs) with low performance in operation into distribution centers exclusively for environment-friendly produce by linking them with environmentally friendly distribution companies.

Various types of promotion projects including PR through mass media have been implemented to promote environmentally friendly produce and to boost consumption of those products. Guidebooks for purchasing environment-friendly produce and educational materials for children have been produced and distributed

through this project. Efforts to establish a check-off funding program for environmentally friendly produce have been made to contribute to promoting consumption of the produce, and to providing distribution information and to implementing education and study, with a goal of enhancing quality and consumption of environmentally friendly agricultural products. The check-off funding program is to be operated with funds which members of related organizations voluntarily collect, and the government is to provide subsidies to the organizations participating in the program within the funds collected so that they are used for promotion of consumption, research, provision of education and information.

Agricultural Water Quality Improvement Project

The agricultural water quality improvement project is aimed at establishing the base for supplying clean agricultural water and creating a sound living environment for rural residents by preparing plans to improve water quality and the disposal process of deposits in lakes, thereby improving the quality of water in reservoirs and freshwater lakes which are the source of agricultural water. The Korea Rural Community Corporation carries out this project, and any reservoir used for agriculture of which water quality exceeds the "slightly bad" level in the living environment standards under the Framework Act on Environmental Policy is preferentially subject to this project. Those reservoirs with many deposits and high pollution level are to be the target for pilot projects for deposit processing, which has been started since 2009. The support funds of the water quality improvement project can be used to cover construction costs (including purchasing costs for construction materials),

compensation costs for purchasing lands, and additional expenses for facilities (supervising expenses and project management expenses) incurred in the project to improve the quality of water used for agriculture. For the pilot project for processing deposit of reservoirs, the assistance funds can be used for any cost incurred during dredging and processing deposits (including purchasing costs for construction materials), compensation for purchasing lands, and additional expenses for facilities (detail-planning costs, supervising expenses and project management expenses). The financial supports for these projects are provided in the form of state subsidies (100%), and 10 billion won in 2013, 10.2 billion won in 2014, and 12.1 billion won in 2015 were injected in these projects.

Livestock Manure Processing Facility Project

The livestock manure processing facility project aims to prevent water pollution and preserve the living environment, thereby promoting the environmentally friendly livestock industry and vitalizing resource-circulation agriculture by composting and making liquid fertilizer and generating energy sources from livestock manure. Targets of this project include: individual facilities of livestock farms and livestock complexes; distribution centers for liquid fertilizers; and joint resource-generating facilities which enable energy-generating activities (by agricultural corporations and private companies) and activities of composting and making liquid fertilizer from livestock manure (by agricultural corporations including regional agricultural and livestock cooperatives). The financial supports from this project can be used for any expenses incurred in facilities that compost and make liquid fertilizers, facilities that

generate energy sources including biogas, facilities that purify livestock manure and release that purified manure, chaff pulverizers, additional machinery and equipment including carrier tanks for livestock manure, and for installation of joint compost grounds. For the joint resource-generating facilities, the use of the assistance funds is limited to purchasing equipment and installing facilities for composting and making liquid fertilizers and for generating energy from livestock manure. For distribution centers for liquid fertilizers, the assistance funds are limited to purchasing vehicles for scattering liquid manure, and equipment for collecting, hauling, and scattering of liquid fertilizers, including arm-roll boxes and liquid-manure spreaders. The assistance is comprised of central government subsidies (30%), regional government support (20%), and state loans (50%) for individual facilities. In the case of joint resource-generation facilities using livestock manure, the ratio of each subsidy differs from each case: 50% for state subsidy, 30% for regional assistance, and 20% for state loans for facilities that compost and make liquid fertilizers; and 30%, 30%, and 20% for energy-generating facilities, with 20% of self-payment. Maximum assistance amounts by livestock type also vary. Assistance caps for individual facilities and for corporations are 400 million won and 2 billion won for pigs, 200 million won and 800 million won for Korean cows and milk cows, and 200 million won and 1 billion won for chickens, respectively. The assistance amount for joint resource facilities is 4 billion won and 7 billion won for composting and making liquefied fertilizer and for energy generating, respectively. The total assistance funds injected into the project for livestock excretion processing facilities were 130 billion won in 2013, 142.6 billion won in 2014, and 126.6 billion won in 2015.

Performance Evaluation of Environmentally Friendly Agriculture Policies

Evaluations of environmentally friendly agricultural policies implemented in the past show that those policies were successful in examining the potentials of environmentally friendly agriculture in the conditions of Korea and in increasing the number of farm households practicing environmentally friendly agriculture. However, the past policies were insufficient in showing visible outcomes when it comes to the agro-ecosystem quality improvement. Therefore, policies that coordinate cultivation scale and techniques of environmentally friendly farming should be carried out in order to preserve the material balance by region and by water system and to maintain a sound ecosystem. Bold investment and supports by the agricultural sector are needed to advance environmentally friendly agriculture in Korea.

The past and current environmentally friendly agricultural policies have put more emphasis on production of environmentally friendly produce, including expansion of environmentally friendly agricultural complexes, than on environmental loads incurred by agricultural activities. In particular, though there are a number of serious water pollution issues such as eutrophication due to phosphorus runoff and groundwater pollution caused by the runoff of surplus nitrogen component in the agricultural sector, the nation's alert level remains low. Furthermore, environmental issues in the livestock sector is being magnified at a national level, as an appropriate processing system for livestock manure and an environmentally friendly livestock production system have not well established and failed to catch up with pace of scaling-up and specialization of the livestock

sector. In addition, evaluating outcomes of environmentally friendly farming and deciding policy goals and directions are difficult due to the insufficient monitoring system, failing to screen farmers' qualifications for receiving benefits of the environmentally friendly agricultural programs.

The assistance program for livestock manure processing facilities is evaluated to have substantially contributed to changing livestock producers' perception on potentials of practicing environmentally friendly livestock production through recycling of livestock excretion (composting and making liquid fertilizers). In addition, recycling of livestock manure significantly contributed to promotion of environmentally friendly agriculture by supplying organic fertilizers as alternatives to the chemical ones, thereby reducing usage of chemical fertilizers and pesticides. Despite a substantial amount of policy funds injected for processing livestock manure, visible outcome has yet to be attained due to the failing of establishing linkage with crop farms that can resolve unbalance between supply and demand for composts and liquid fertilizers in a region.

Major Implementation Plans for Improving Environmentally Friendly Agriculture

Establishment of Infrastructure for Environmentally Friendly Agriculture

In order to implement effective action plans to advance environmentally friendly agriculture, a regional-level road map for expanding resource-circulation agriculture (crop cultivation sector) and environmentally friendly livestock farming (livestock sector) needs to be devised based on phase-in approaches. First, infrastructures for

environmentally friendly agriculture should be established by developing technologies and human resources, by establishing monitoring systems, by supporting distribution promotion, and by dividing roles among related parties. When it comes to technology development, best management practices (BMP) need to be established and disseminated in consideration of environmental conditions at the regional level for effective management of environmentally friendly resources. In the case of human resource development, young and talented farmers must be nurtured in each region as green farming entities. Those green farming entities who will be encouraged to participate in the training programs both at home and abroad should be nurtured as leaders practicing environmentally friendly agriculture. In addition, databases of an agricultural environment monitoring system and agricultural environment indicators are to be established to identify and analyze the impacts of agricultural production activities on environmental loads in the long term. In particular, establishing a monitoring system to measure changes in the regional agricultural environment including water, soil and the ecosystem is a must so as to create a sound environmentally friendly agriculture. To this end, mid-to-long-term programs by stage should be devised to create a regional agricultural environment map using a geographic information system (GIS) and to establish an agricultural environment load system.

Establishment of the Regional Resource-circulation Agriculture System

In order to establish a regional resource-circulation agricultural system, by-products generated in the process of cultivating crops

and of raising livestock should be recycled as much as possible, and comprehensive management of soil, nutrients, pests and irrigation should be carried out in consideration of regional characteristics. Demonstration sites for the resource-circulation agricultural system should be developed and expanded to many regions in order to systematically link the crop sector and the livestock sector depending on the condition of each location. In addition, precise analysis of the amount of chemical inputs currently being used based on the material balance and development of chemical fertilizer-reducing cultivation technologies are to be prepared in order to reduce the amount of chemical inputs and pesticides that flow out to the agro-ecosystem. In particular, a system in which organic resources such as livestock manure and food waste can be recycled comprehensively is needed to create the regional resource-circulation system.

Policy Mix of Economic Incentives and Regulations

Economic incentive measures that may affect environmentally friendly activities include subsidies, environmental taxes, and cross compliance systems. The environmental cross compliance system, which combines subsidies with regulations, has been utilized as a powerful economic incentive. Currently, there are a number of menu-type direct payment systems that are linked to the management system for environmentally friendly agricultural resources such as support for farm households cultivating cover crops (milk vetch, rye, etc.) in the wintertime; support for farm households cultivating water purification crops (lotus, parsley, etc.) in farmlands adjacent to influents of reservoirs and lakes; and support for farm households that have voluntarily reduced their size of livestock busi-

ness based on regional material balance levels. However, in addition to the existing supports, incentive measures should include further benefits according to the achievement level in the regional material balance, if the environmentally friendly activities are carried out in connection with the environmentally friendly agricultural zone construction project based on regional resource circulation. In addition, environmental cross compliance program should also be expanded to lead changes in the cultivation size and techniques within the permissible levels for environmental loads. On top of that, introduction of a Regional-based Total Maximum Nutrient Loading System and a trading system for livestock breeding rights should also be reviewed in the mid-to-long term in order to preserve regional environmental assimilating capacities.

Diagnosis of Climate Change and Countermeasures

Current Status and Projection of Climate Change

The global average temperature is estimated to have risen by 0.85℃ (0.65-1.06℃) over the past 133 years from 1880 to 2012 due to global warming. Changes in average precipitation are not clear, but precipitation of lands at the mid-latitudes in the northern hemisphere has increased since 1901. According to the fifth assessment report on climate change (2014) released by the Intergovernmental Panel on Climate Change (IPCC), the global average temperature is projected to increase by 3.7℃ (2.6-4.8℃), and the sea level will rise by 63 cm compared to 1986–2005 at the end of 21st century (2081-2100), if the current trend of greenhouse gas emission continues (RCP 8.5: CO_2 concentrations will reach 936 ppm by 2100).

According to the Projections of Climate Change in the Korean

Peninsula (2012) by the Korea Meteorological Administration, the warming trend will continue until 2100 based on observation data accumulated over the past 30 years. In RCP 8.5 scenario, the yearly average temperature is projected to increase by 1.5℃ in the early 21st century, by 3.4℃ in the mid-21st century, and by 5.7℃ in the late 21st century, demonstrating ever-accelerated pace of warming. In RCP 8.5, the yearly average temperature in the late 21st century is expected to be 16.7℃ which is the current yearly average temperature of the southern part of Jeju Island. In other words, the Korean peninsula is forecast to be fallen under the subtropical climate zones except Inje, Hongcheon, Wonju, and Jecheon surrounding Daegwallyeong.

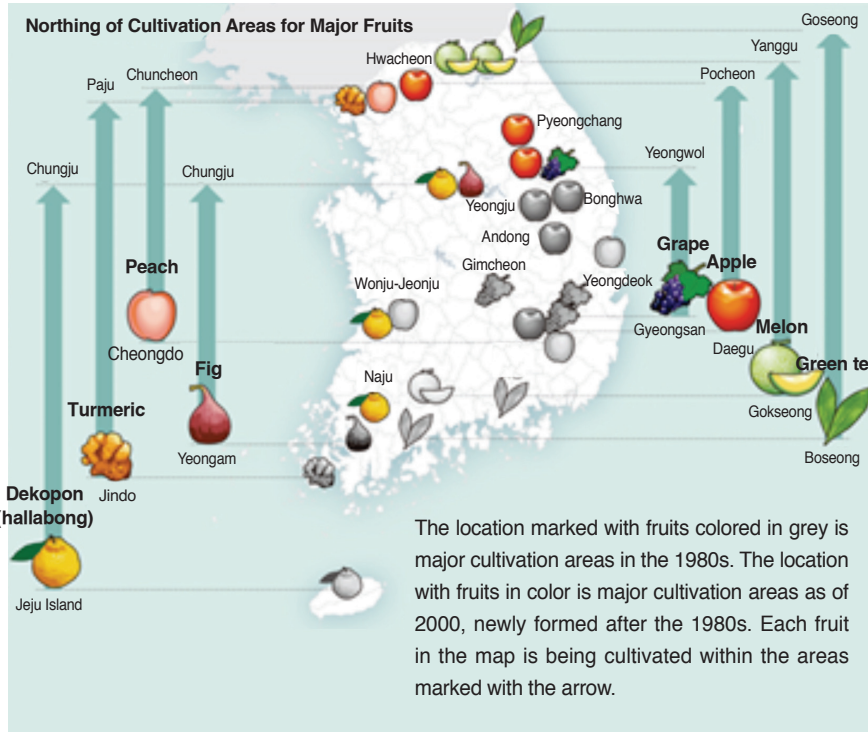
Impacts of Climate Change

There are a number of climate change impacts on the agricultural sector: biological changes such as flowering and heading of crops; quality changes of crops; and changes of major production areas for crops following the northing latitudinal shift of suitable lands for cultivation. The current status of changes in suitable cultivation areas shows that the northern limits for cultivation for winter Chinese cabbages, winter potatoes, rye, apples, peaches, tangerines, and green tea have already gone north considerably. The winter Chinese cabbages and winter potatoes, produced only in Jeju Island until 1985, are now cultivated in the southern seaboard. Cultivation areas for apples, which were Daegu and Gyeongsangbuk-do in the past, have been also expanded to include the northern Gyeonggi-do including Paju, Pocheon, and Yeoncheon regions. The northern limits for cultivation for peaches, tangerines, and green tea moved up to

Gyeonggi and Gangwon Provinces from Gyeongsangbuk-do; Geoje, Goheung, and Naju regions from Jeju; and Goseong in Gangwon-do from Boseong and Hadong regions, respectively. In particular, the safe cultivation zones for rye moved from below Chungcheong-do to the middle of Gyeonggi-do. In 2013, the Rural Development Administration of Korea developed a forecast map for changes in cultivation areas using the "Future Digital Climate Map for Agricultural Use" in order to respond to climate change (Figure 6-12). The forecast map was developed based on the scenario that climate change continues while crop types and cultivation techniques are maintained, and upcoming changes of cultivation areas for Korea's major six fruits (apple, pear, peach, grape, sweet persimmon, and tangerine) between 2010 and 2090 were forecast by 10 years in detail. According to the forecast map, the total cultivation area (suitable cultivation areas and cultivation-capable areas) for apple will continue to decrease, while that for pear, peach and grape will inch up until the mid-21st century and start to decrease. The cultivation-capable areas for sweet persimmon and tangerine will increase. Estimates of cultivation-capable areas demonstrate that both suitable cultivation areas and cultivation-capable areas for apple will rapidly decrease compared to those areas over the past 30 years, and the cultivation will occur only in parts of Gangwon-do. In general, a temperature rise of 1℃ translates into the 80 km of northing and a 150m increase in altitude for suitable cultivation areas. Therefore, cultivation for subtropical crops is projected to increase and that for indigenous crops will decrease due to climate change.

For a precise analysis of impacts of climate change, the Korea Rural Economic Institute established the Korea Agriculture

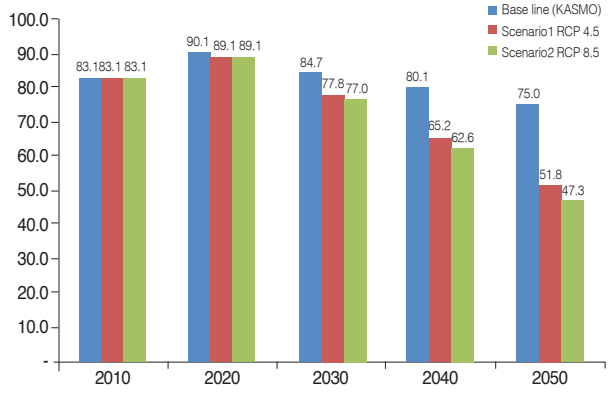
Figure 6-12 Climate Change-induced Changes in Suitable Cultivation Areas for Major Crops



Source: Rural Development Administration (2014).

Simulation Model for Climate-Agriculture Relations (SIMCAR) by linking crop growth models and farming simulation models. The analysis of impacts of climate change using SIMCAR shows that the rice self-sufficiency rate as of 2050 will fall by 18.3%p more in the RCP 8.5 scenario compared to the baseline scenario, and the self-sufficiency rate of rice will fall to around 50% due to climate change, creating a food security issue where half of rice consumption should rely on imports (Figure 6-13).

Figure 6-13 Impacts of Climate Change on Rice Production and Self-sufficiency Rate



Source: Kim Changgil et al. (2014)

Countermeasures for Climate Change

The Korean government prepared a policy foundation that enables inter-departmental, systemic and consistent implementation of countermeasures for climate change by enacting the "Framework Act on Low Carbon, Green Growth" in 2010, through which a five-year plan for the national strategy of low carbon, green growth is to be established every five years and implemented for the period. In terms of mitigation, Korea sets a national goal of reducing greenhouse gas emissions and carries out necessary measures.

The agricultural sector has been implementing both adaptation and mitigation policies in order to be preemptive to climate change. The following adaptation measures are being carried out in order to enhance agricultural productivity in response to climate change.

First, the R&D projects for development of agricultural green

technologies were implemented between 2009 and 2013, reaping excellent outcomes such as development of varieties resistant to high temperature and disasters and selection of excellent resources. In 2014, the "Second-step Mid- and Long-term Plans to Develop Agricultural Technology for Climate Change," slated to end in 2023, was established.

Second, the system that predicts outbreak of plant diseases and insect pests from outside Korea and the technologies that diagnose infectious livestock disease were developed and have been operated.

Third, the early warning system for meteorological disasters was established and has been operated. The system is being operated on a trial basis in order to preemptively respond to climate disasters that would wreak havoc on Korean agriculture. The system provides detailed weather forecast customized for farm households and farms. Together with development of technologies that quantify the level of agricultural meteorological risks for major crops, this early warning service has been expanding nationwide.

Fourth, the agricultural disaster insurance, which functions as a risk-management tool, has been expanded. In order to respond to climate change preemptively, efforts have been made to expand the range of insurance targets and subscribers, thereby to create favorable conditions to farms again and to achieve economic stability of farm households affected by natural disasters.

Fifth, strategic and effective water management has been carried out. In order to prepare for any future damage incurred by climate change, the repair or renovation of agricultural facilities including irrigation facilities, the construction of new facilities, and the drainage improvement for farmlands prone to flood have been carried out.

Sixth, an increasing number of disaster prevention facilities have been built. Efforts have been made to expand ICT Convergence-type Smart Farms that reduce the input of energy, water, and chemical fertilizers and increase agricultural productivity by providing design standards for crop cultivation facilities which reflect aspects and prospects of climate change.

Policies for reducing greenhouse gas (GHG) generated in the agricultural sector, divided into those for crop and livestock sectors, have been implemented. For the crop sector, the existing method of keeping water fully filled in farming areas was shifted to the method of supplying water only when it is needed, in order to reduce the amount of N_2O. It turned out that this method would reduce greenhouse emissions by 40%. In addition, the use of chemical fertilizers is being minimized by encouraging the use of organic fertilizers. In the livestock sector, there are policies for using electricity generated through livestock manure and for increasing the number of facilities that produce composts and liquid fertilizers. In order to reduce ammonia gases generated during the livestock feeding operations, high-quality bulky feeds have been continuously produced and disseminated. In the horticultural sector, supports for new renewable energy facilities including the heating and cooling system using geothermal heat and energy-saving facilities including multi-layered thermal screens have been made in order to reduce the usage of fossil fuels. The "Low Carbon Certification System for Agricultural and Livestock Products," the Korean version of carbon footprint system, has been introduced to help agricultural enterprises develop capabilities for GHG reduction, thereby to achieve reduction goals. The low carbon certification system helps ethical consumers to pur-

chase agricultural produce certified as low carbon products and to participate in the reduction of GHG emissions and the initiative for raising energy efficiency. In addition, the "Voluntary GHG Reduction Program of Agriculture and Rural Areas," the Korean version of carbon offset program, has been implemented. Through this program, the government, after a verification process, either supports trading of certified emissions reductions or purchases them from farmers who voluntarily choose agricultural techniques generating low carbon and achieved the reduction goal. The third verification organization issues certificates of GHG reductions made by farm households in accordance with international standards, and the government purchases the emissions reductions at 10,000 won per ton, providing an income source for farmers while reducing energy costs. The Korean government plans to carry out in-depth, national-level research and analysis of impacts of climate change on the environment of Korean agriculture and rural areas. The reports on impacts of climate change and vulnerabilities of the Korean agricultural sector and the results of fact-finding investigations, created through collaboration with related research centers, will be released every five years. Those reports are to be utilized as preliminary data for designing policies in order to systematically respond to climate change. In addition, the government plans to establish a "Farm-unit Early Warning System for Meteorological Disasters" by 2018 and provide in advance 12 types of meteorological information (including temperature, precipitation, and wind) for 15 agricultural items. On top of this, soil moisture and soil nutrient amounts of each farm are measured using the Internet of Things (IoT) in order to identify the right time for water supply and fertilizers and to prevent damage from diseases and insect pests.

6. International Agricultural Development and Cooperation

Background

The World Bank reported that the share of the population living in extreme poverty dropped from 52% in 1981 to 21% in 2010, while the developing world population jumped by 59% in the same period. But some 1.2 billion people of the 7 billion on this planet remain in extreme poverty (World Bank, 2013). More than 0.4 billion people in Sub-Sahara Africa are still suffering from extreme poverty by 2015, the deadline year for the Millennium Development Goals (MDGs), which aim to cut the extreme poverty rate to half of its 1990 level (IRD/World Bank, 2015).

Global poverty issues indicate that international cooperation in the agriculture and forestry area should play an important role in helping developing economies to eradicate poverty and improve agriculture. Agriculture is one of key industries in underdeveloped countries: two thirds of those living in poverty engage in farming; three fourths of the poor live in the rural area. This obviously shows that development of agriculture and rural communities can be a key to poverty reduction and economic development. The Sustainable Development Goals (SDGs), covering 17 agendas of international development and cooperation, also include "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture" as Goal Number Two, stressing the importance of agriculture (SDSN, 2015).

Korea is the only country in the world that has seen its status change from an aid recipient to a donor country after World War

II. Understandably, many economies want to learn about how the country achieved tremendous economic growth in such a short period of time. As for agriculture in Korea, the Green Revolution in the mid-1970s helped the country to become self-sufficient in rice, the country's staple crop, and the White Revolution in the 1980s made it possible to have a year round supply of fruit and vegetables from greenhouses. Korean agriculture is now seeking to transform from a declining industry into a higher value-added high-tech industry.

The *Saemaul* Movement, which began in the 1970s, has been known in many underdeveloped countries as a campaign to improve rural Korea under three principles of diligence, self-help, and cooperation, based on close ties amongst community members. The movement carried out various policies focusing on rural areas and agriculture while the country grew rapidly, which now serves as a precious lesson for the developing world.

Progress

Korea's budget for global cooperative projects has jumped from 0.8 trillion won in 2005 to 2.4 trillion won in 2015, growing an average of 12% annually in the past decade, though the amount is still smaller than that of other OECD member countries. In 2015, Korea plans to allocate its budget to Asia (46%), Africa (17%), Middle East and CIS (6%), and Central and South America (5%). The Korea International Cooperation Agency (KOICA) has provided grant aid mainly for development projects (28%), and is raising the share of technical cooperation such as development consulting (12.5%) in recent years. The Economic Development Cooperation Fund (EDCF), a fund for loan aid, primarily assists infrastructures such as transportation,

energy, water, and sewage. About 5% of Official Development Assistance (ODA) is directed to the agriculture, forestry, and fishery sector, and grant aid in the field makes up 10% (83.6 billion won) (Office for Government Policy Coordination et al., 2015).

International agricultural development and cooperation, led by the Korean Ministry of Agriculture, Food and Rural Affairs (MAFRA) and its affiliated and related agencies, has expanded both in terms of quantity and type since 2006.

Ministry of Agriculture, Food and Rural Affairs (MAFRA)

MAFRA has increased its budget for international development and cooperation about 40 times from 354 million won in 2006 to 13,991 million won in 2014, totaling 56,943 million won for nine years. The budget was allocated for short-term projects including technical training, seminars, and demonstration projects in the early

Table 6-21 International Agricultural Development and Cooperation Projects, 2006-2014

Unit: million won, number of projects, and percentage

		2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Budget		354	826	1,408	2,301	4,707	10,030	10,510	12,816	13,991	56,943
Number of Projects	Total	5	11	14	17	15	22	18	19	18	57
	Comprehensive Cooperation	5 (100)	11 (100)	14 (100)	17 (100)	15 (100)	20 (91)	15 (83.3)	14 (73.6)	13 (72.2)	52 (91.2)
	Joint Cooperation (Multi-bi)	-	-	-	-	-	2 (9)	3 (16.7)	4 (21.1)	4 (22.2)	4 (7.0)
	Consulting (KAPEX)	-	-	-	-	-	-	-	1 (5.3)	1 (5.6)	1 (1.8)

Source: Park, 2015.

years, and then the coverage was extended to mid-term projects that last three or four years. The ministry carried out 13 projects in 2014, and has conducted 57 projects in total since 2006 (Park, 2015).

Table 6-21 shows the figures for International Agricultural Development and Cooperation Projects between 2006 and 2014.

ODA projects headed by MAFRA fall into three categories: Comprehensive Cooperation, Joint Cooperation, and Korean Agricultural Policy Experiences for Food Security (KAPEX). Comprehensive Cooperation is a project that combines technical support by experts and physical support such as provision of facilities and equipment, and Joint Cooperation is undertaken with international bodies. KAPEX provides policy consulting for developing countries based on Korea's agriculture development experiences. In 2015, MAFRA is carrying out a total of 13 Comprehensive Cooperation projects in nine Asian and four African countries, and KAPEX projects in three countries. Joint Cooperation involves three projects with FAO and two with IFAD (Park, 2015).

Rural Development Administration and Korea Forest Service

The Rural Development Administration (RDA) engages in a 15.7 billion project that provides agricultural technology for developing countries, separately from MAFRA (Choi, 2015).

One of core projects led by the RDA is a cooperation program centered on local offices of Korea Project on International Agriculture (KOPIA) located in 20 developing nations (8 Asian and 6 African and 6 Central and South American countries). The administration has sent experts to KOPIA offices to undertake projects such as in-

Table 6-22 Details and Target Crops of KOPIA Offices

Year of Opening	Asia (8 countries)	Africa (6 countries)	Central and South America (6 countries)
2009	Vietnam (vegetables, bio-energy) Myanmar (rice) Uzbekistan (forage crops)	Kenya (root crops)	Brazil (mushrooms, strawberries) Paraguay (vegetables, potatoes)
2010	The Philippines (rice) Cambodia (corn)	D.R. Congo (rice, cassava) Algeria (vegetable, barley)	
2011	Thailand (tissue culture of vegetables, orchid, etc.) Sri Lanka (beans, vegetables)	Ethiopia (vegetables)	Bolivia (potatoes) Ecuador (greenhouse vegetables)
2013	Mongolia (vegetables, livestock)	Uganda (corn, beans) Senegal (rice, vegetables)	Peru (potatoes, quinoa) Dominica Republic (fruit trees, vegetables)

Source: Choi, 2015.

struction of customized agricultural technology, joint research of genetic engineering of plants, and assistance for overseas private agricultural companies, and has nurtured global human resources by educating agricultural college students in overseas training programs. Another key program is dedicated to building KOPIA Demonstration Village that helps increase farming income by transferring technology at the village level.

The administration also organized the Food and Agriculture Cooperation Initiative in three regions including Asia (12 countries), Africa (18 countries), and Central and South America (13 countries) to work on various projects that make concerted efforts to tackle major agricultural issues in each region: setting up information networks for joint approach to control mobile disease and insect pest

of rice caused by climate change; transferring DNA-based technology for livestock improvement such as artificial insemination and transplantation of fertilized eggs; and building networks that increase rice productivity through water management technology.

The Korea Forest Service (KFS) allocated 11.2 billion won for the year of 2015 to fund international cooperative projects: policies to implement global agreements like the *Changwon* Initiative proposed in the United Nations Convention to Combat Desertification (UNCCD) meeting and the Forest Ecosystem Restoration Initiative in the Convention on Biological Diversity (CBD); joint projects with international organizations such as the Food and Agriculture Organization of the United Nations (FAO), the International Tropical Timber

Table 6-23 International Cooperation Projects Headed by KFS

		2015 Budget (million won)	Projects	Project Duration
Bilateral projects	- Mongolia	2,007	Greenbelt plantation project in Mongolia	2007-2016
	- Indonesia	960	Rumpin Seed Source and Nursery Center	2009-2018
	- China	250	Support on private plantation for anti-desertification	2007-
Multilateral projects	- AFoCo	4,560	Joint projects with AFoCo	Indefinite
	- UNCCD	2,000	Implementation of Changwon Initiative	Indefinite
	- CBD	500	Implementation of Forest Ecosystem Restoration Initiative	Indefinite
	- ITTO	346	Payment of levy imposed by ITTO	Indefinite
	- FAO	300	Dispatching special employees for FAO projects	Indefinite
	- IUCN	11	Payment of levy imposed by IUCN	Indefinite

Source: Baek, 2015.

Organization (ITTO), and the International Union for Conservation of Nature (IUCN); and international cooperation through ASEAN-ROK Forest Cooperation (AFoCo) (Baek, 2015).

Bilateral cooperative projects led by KFS include the greenbelt plantation project aiming to afforest 3,000 ha in Mongolia (2007-2016), operation of Rumpin Seed Source and Nursery Center and assistance for forest recreation and ecotourism in Indonesia, and support on private plantation for anti-desertification in China. KFS established the Korea-Indonesia Forest Cooperative Center in Indonesia in 2011, and plans to set up Mekong Forest Cooperative Center in Cambodia in 2016.

Outlook and Tasks

Outlook

In 2016, MDGs, the existing international development and cooperation paradigm, will be replaced with SDGs, a new agenda that contains broader 17 goals aiming to achieve not only social development like ending poverty but also economic growth and environmental sustainability. For development resources, private sectors and private-public partnership (PPP) started to emerge as an important source of global aid and investment in addition to public sectors. In the same year, Korea is going to establish the Second Master Plan for International Development and Cooperation (2016-2020), and rearrange its ODA strategy by updating a list of partner countries and setting up country-specific cooperation strategies.

Although the Korean government failed to meet its target for an ODA/GNI ratio of 0.25% by 2015, its ODA budget has shown a rapid growth and is anticipated to be on the rise at the request of the in-

ternational community. The same will be true of the agriculture, forestry, and rural development sectors. Agencies involved in agriculture such as MAFRA are expected to steadily grow global cooperative projects. They will extend cooperative efforts from Asia to other regions including Africa, and undertake more joint projects with international bodies such as IFAD. Apart from implementation of comprehensive cooperation projects, emphasis will be placed on project management across the life cycle of projects, covering formulation of new projects, monitoring of projects in progress, and evaluation of closed projects.

Tasks

A decade has passed since MAFRA and other related government agencies began their international development and cooperation in earnest in 2006. Now is time to evolve from laying foundations through expansion and stabilization of implementation systems, to undertaking tasks to secure effectiveness, efficiency, and mid- and long-term impact and sustainability of projects. MAFRA has evaluated its past ODA projects and figured out some causes of unsuccessfulness which include recipient countries' failure to perform obligations, lack of study and understanding of fields, over-diversification of projects, and absence of facility maintenance (Park, 2015).

Future international cooperative projects in the agriculture, forestry, and rural development sectors need to reduce trial and error through study of feasibility and baseline surveys in the process of designing projects. Result-based management (RBM) is necessary during implementation of projects, ranging from use of baseline surveys to define performance indices to monitoring based on those

indices. And post evaluation is needed immediately when each project is over, and, after a certain amount of time, in ways that assess mid- and long-term effects and draw up measures to provide follow-up management and feedback. More focus on technical cooperation related to projects could help overcome the challenges found from the previous projects.

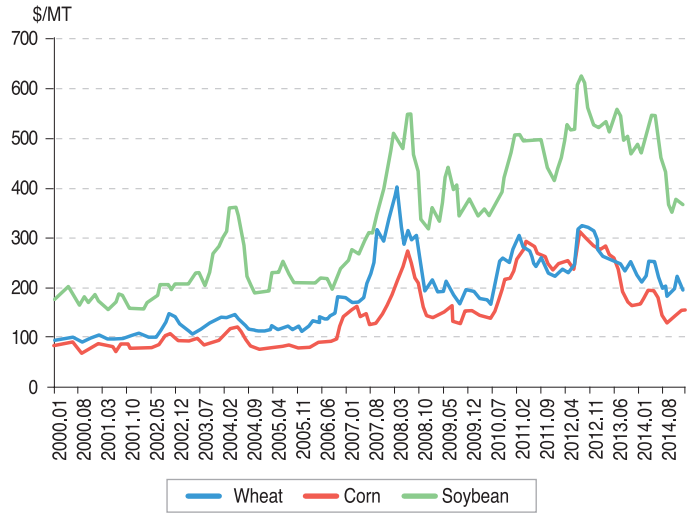
Overseas Agricultural Development

Overview of Overseas Agricultural Development

Global food balance is growing unstable due to the rising natural disasters caused by climate change, and the increasing world population. Worse yet, industrialization and urbanization have led to a dramatic decrease in arable land, while the global agricultural commodity market becomes less predictable due to the increased volatility in oil and grain prices, which directly affect the supply and demand for food. In particular, there are dramatic changes in various factors that affect global food security. For example, the fluctuation in global grain prices is becoming increasingly sharp, displaying heightened global awareness of food security. Regarding strategies on food security for each country, exporting countries try to take the opportunity to expand their agricultural market share through greater investment in the related industries, while importing countries pursue policies that help increase self-sufficiency to secure stable food supply, showing the conflicting interests of the two opposing sides (Lee et al., 2014).

Korea, one of the major grain importers, has been making various attempts to strengthen food security in consideration of changes in the global grain market, which started to show instability since

Figure 6-14 International Grain Prices



Source: CBOT (Last accessed in April 2015)

the early 2000s. In order for strengthening food security, Korea has been introducing and implementing measures to increase self-reliance through increasing productivity, to invest in overseas agriculture, and to nurture global grain companies (Lee, 2013). However, the project to nurture global grain companies has faced with various difficulties including high barriers to entry to the global grain market, and a lack of experience and resources. Given the scale of land in Korea and the fact that Korea imports 15 million tons of grains annually, achieving self-reliance is not easy for Korea (Lee, 2014). To address these issues, the Korean government regarded the establishment of a stable food supply system through overseas agricultural development as one of the realistic options to strengthen food secu-

rity, and has been implementing related projects.

Support and Implementation Systems for Korea's Overseas Agricultural Development

In order to develop overseas agriculture, the Korean government established the "10-year Plan for Overseas Agricultural Development" and has implemented related activities. In particular, the Overseas Agricultural Development and Cooperation Act was enacted, establishing a policy system through which operators of overseas agricultural development projects can receive supports from the government. Under this law, private enterprises which invest in overseas agriculture can obtain loans or subsidies from the government, and other projects including fostering and managing human resources, and establishing an integrated information system are also being implemented.

The government provides loans necessary for acquiring a business permit, and installing and operating facilities for an overseas agricultural development project. In addition, utilization of the loans includes purchasing overseas agricultural resources, investment in storage, processing, transportation, sale, and other necessary activities. In particular, the projects financed under the law are being operated in a way that the government takes risk factors in overseas agriculture investment. For instance, when it is impossible for the operator of an overseas agricultural development project financed under the law to repay a loan due to a failure of the project, he/she may be fully or partially exempted from the principal and interest. Loans are preferentially provided to projects that aim at securing distribution bases for food and fodder crops by cultivating grains

and fodder crops such as corn, wheat, and soybeans, which do not compete with domestic agricultural produce. The law also stipulates compulsory provisions that companies financed under the law should bring agricultural products produced overseas into Korea in case of emergency.

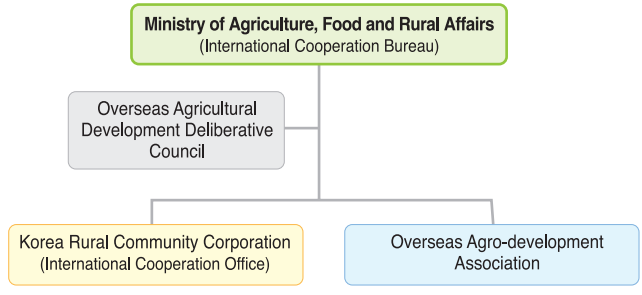
The government's subsidy is provided for private enterprises' expenses of the feasibility study for overseas agricultural development, expenses of technical development and training for specialized human resources for the projects, expenses for international cooperation and technical exchange, expenses of collection, analysis and provision of information on overseas agricultural development, and expenses for evaluation and research on the projects. The Korea Rural Community Corporation was entrusted to conduct the implementation of the subsidy, and subsidies have been mainly used to support part of expenses incurred in surveying investment conditions of target regions, considered as an eligible area for investment by private companies that wish to start overseas agricultural development projects.

The projects to establish an integrated information system and to foster human resources have been implemented for the purpose of promoting overseas agricultural development projects comprehensively and systematically, and providing necessary information to those in need. The information system provides various data: study results on the investment environment of overseas agriculture; overseas agriculture data; study results on the overseas agricultural market; data on the current status of agricultural situation of the target countries; information on agricultural investment and international trends; and other research materials for consulting. The

project to foster professional human resources is being carried out in order to consistently promote overseas agricultural development by nurturing and managing experts on this field. The ultimate goal of this human resources project is to train and supply experts specialized in agriculture of the regions, namely, Africa, Southeast Asia, and Central and South America, which have different agricultural environmental conditions and production methods from Korea, and this constitutes a part of strategy for Korea to succeed in overseas agricultural development in the long term. Implementation of this project was entrusted to the Overseas Agro-development Association (Heo et al., 2014).

The structure for Korea's overseas agricultural development is displayed in Figure 6-15. The overseas agriculture development team at the International Cooperation Bureau in the Ministry of Agriculture, Food and Rural Affairs directs overall overseas agricultural development projects. And under Article 5 and 6 of the Overseas Agricultural Development and Cooperation Act, the Overseas Agricultural Development Deliberative Council deliberates on matters

Figure 6-15 Overseas Agricultural Development System



concerning the formulation of a comprehensive plan for overseas agricultural development, matters for strengthening the competitiveness of overseas agricultural development projects and creating the foundation of the development, and matters concerning administrative and financial support for promoting the projects. The Vice Minister for Agriculture, Food and Rural Affairs is the position of the chairperson of the Deliberative Council, composed of public officials belonging to related central departments and non-government experts. The International Cooperation Office of the Korea Rural Community Corporation is responsible for carrying out tasks entrusted by the Ministry of Agriculture, Food and Rural Affairs in relation to the Overseas Agricultural Development and Cooperation Act, while it acts as a proxy in deliberating on loans applied by private companies and subsidies. The Overseas Agro-development Association provides information and consultation for smooth progress of overseas agricultural development activities, and engages in diverse tasks including the project to train experts (Heo et al., 2014).

The Current Status of Korea's Overseas Agricultural Development

As of December 2014, as many as 149 private companies invested in 27 countries with 151 projects. Among the regions that Korean companies invested in, the Southeast Asian region that includes Cambodia and Indonesia displays marked performance, followed by the Russian Far East region. In 2014, approximately 53,677 hectares of farmlands were developed by the Korean companies that advanced into overseas farmlands, a 16,000 hectares decrease from

69,720 hectares developed in 2013[1]. Southeast Asia accounted for 62% and 50% of the total overseas farmlands developed by Korean companies in 2013 and 2014, respectively. The Russian Far East took up 32% and 43% of the total overseas farmlands developed by Korea in 2013 and 2014, respectively. In other words, Korea's overseas agricultural development is focused on these two regions, accounting for 94% in 2013 and 93% in 2014.

In addition, 11 and 12 Korean companies advanced into Mongolia and Central Asia including Ukraine, respectively, and Korean companies engage in overseas agricultural development in Central and South America (5 companies) including Brazil (3 companies), Africa (6 companies) including Mozambique and the Democratic Republic of the Congo, and the US, Australia and New Zealand (7 companies). Despite the efforts to diversify target regions, the volume of secured agricultural produce is concentrated in Southeast Asia and the Russian Far East (Table 6-24).

Most of the countries that Korean private companies advanced into are those in the Russian Far East and Southeast Asia, and those regions have attempted a transition to a free market system. And the one thing in common is that those countries suffered a dramatic fall in agricultural productivity in the process of moving to the market economy. Against this backdrop, these countries are striving to attract foreign investment in agriculture in order to reconstruct their agricultural production bases and to increase agricultural productivity. However, legal and institutional systems for agricultural invest-

1) Corn, cassava, soybeans, and coffee are among the major agricultural products produced by Korean companies which entered into Southeast Asia, and bananas, stevia, sesame, wheat, potatoes, and grapes are also being cultivated.

Table 6-24 The Current Status of Korea's Advance into Overseas Farmlands by Countries

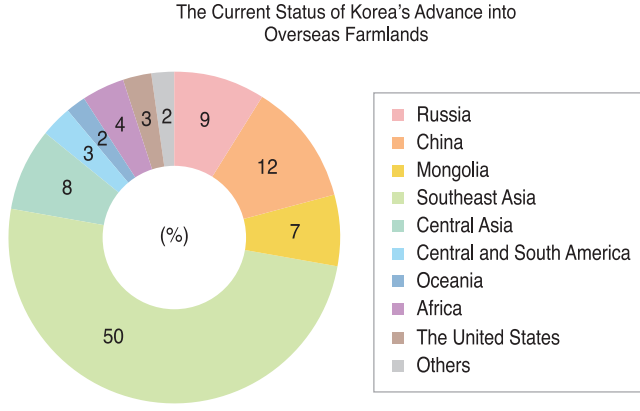
Country	Companies/ Individuals	Developed areas (ha)		Volume of secured produce (t)		Volume of produce brought to Korea in 2014 (t)
		2013	2014	2013	2014	
27 countries	149 companies 151 projects	69,720	53,677	284,182	195,235	7,020
Russia	13	22,449	23,079	51,834	60,436	6,212
China	19	11	50	84	1,237	-
Mongolia	11	3,825	1,420	4,490	1,250	60
Cambodia	24	15,414	14,643	112,172	91,913	10
Indonesia	18	24,465	10,788	99,627	30,150	-
The Philippines	12	218	-	870	-	-
Laos	10	2,349	509	11,510	3,700	-
Vietnam	10	64	82	163	113	-
Myanmar	1	415	819	850	848	738
India	1	-	-	-	-	-
Pakistan	1	-	-	-	-	-
Sri Lanka	1	-	-	-	-	-
Kazakhstan	1	-	80	-	-	-
Kyrgyzstan	6	-	134	-	-	-
Uzbekistan	2	-	-	-	-	-
Tajikistan	1	-	-	-	-	-
Ukraine	2	-	-	-	-	-
Brazil	3	250	624	69	2,701	-
Uruguay	1	-	54	-	174	-
Chile	1	23	28	60	102	-
The United States	4	-	-	-	-	-
New Zealand	1	-	-	-	-	-
Australia	2	107	68	2,000	-	-
Madagascar	1	94	52	453	1	-
Uganda	2	20	-	-	-	-
Democratic Republic of the Congo	2	16	1,247	-	2,610	-
Mozambique	1	-	-	-	-	-

Source: http://www.oads.or.kr (Last accessed in July 2015)

ment by foreign countries are not well prepared in these countries, and relations between the central and local governments are not yet clearly established. There also exist a number of risk factors such as public officials' corruption, difficulties in the overhaul of agricultural infrastructures, and export restriction on grains in case of international grain crisis.

The Russian Far East and Southeast Asia are regions adjacent to Korea, and political, diplomatic, and economic cooperation with Korea is being intensified. In particular, about 50% of Korea's international development cooperation support goes to Southeast Asia, showing ever-strengthening cooperative relationship with the region. Private companies have advanced most into this region for the favorable production conditions of grains including rice and corn, and fruits and vegetables, thanks to its monsoon climate with high temperature and humidity. Companies that entered into Southeast Asia are concentrated mostly in Cambodia, Vietnam, the Philippines,

Figure 6-16 Distribution of Korean Companies that Advanced into Overseas Farmlands



Indonesia, and Laos. Among the total of 75 Korean companies advanced into, 24 companies are in Cambodia, 18 in Indonesia, 12 in the Philippines, 10 in Laos, 10 in Vietnam, and 1 in Myanmar.

In 2001, a year after the June 15th North-South Korea Joint Declaration was adopted, Korea became interested in the agricultural investment in the Russian Far East, and the central government-level study on agricultural conditions of the Maritime Province was undertaken. Since then, private companies actively advanced into the region, but most of them withdrew their projects as they failed to adapt to the local conditions. However, interest in agricultural cooperation has been renewed after the Korean and Russian governments agreed to cooperate in developing the Far East in 2013 (Lee et al., 2014).

Companies that advanced into the Russian Far East in the early 2000s including Agro Sangsaeng, a local subsidiary of Daesunjinrihoe, and Univera (previously Namyang Aloe) are evaluated to have succeeded in localizing their operations. Aro-premorie of Intops, Ecohoz of Seoulfeed, and Hyundai Resources Development of Hyundai Heavy Industries entered into the region between 2008 and 2009, and they are actively engaging in agricultural development projects, increasing the scale of agriculture.

Those companies seem to pursue the economies of scale by forming large-scale farms, judging from the fact that each farm is more than 3,000 hectares, though the scale of farms owned by each company in the region varies, and the fact that the grains such as beans and corn are being cultivated. Currently, those companies that entered into the Russian Far East are investing in the expansion of farmlands, in additional purchase of agricultural machinery, and

in establishment of storages. These companies have common characteristics: they are backed by the parent company with abundant funds for investment; they pursue extensive agriculture; most of them have agricultural production experience less than five years; their parent companies have no connection with agriculture; and they are identified to be in the process of reviewing feasibility of entry into business in connection with agriculture, such as livestock, processing, and distribution (Lee et al., 2014).

Tasks

Recently, the international supply and demand for grains is growing unstable due to its greater price volatility caused by growing demand for grains from emerging economic powerhouses such as India and China, and increasing popularity of bio-energy. As price fluctuations in the global grain market are ever-intensified due to the influx of speculative funds and an oligopoly by Grain Majors, Korea, the fifth largest grain importer, should prepare countermeasures to mitigate risks caused by global grain price fluctuations and changes in supply and demand for grains. In addition, to address issues on food security, it is necessary to analyze its failures in the past and come up with suggestions for sustainable operation of overseas agricultural development.

Companies that advanced into overseas farmlands for agricultural development withdrew themselves for various reasons: lack of advance information; lack of expertise, difficulties in handling produce after harvest; troubles in bringing the produce into Korea due to high tariffs and logistics costs; lack of understanding of local laws, institutions, and customs; difficulties in securing agro-materi-

als; obsolete local infrastructures; problems occurring in the process of entering into and implementing the lease contract; shortage of experts on extensive agriculture; and absence of strategies for distribution and sales. In particular, the companies that entered into overseas farmlands early on had difficulties in handling products after harvested. They had put too much focus on farmlands and production, failing in creating an integrated system that connects processing, storage, distribution, and sales of the products. This shows that technological investment and human resources are important, but establishing a management system after harvest[2] is equally critical in stable operation of the projects and investment attraction.

For the production part, it is necessary to establish a support system to provide advanced production technology and train and secure repair experts for agricultural machinery in order to produce high value-added products. In the case of the Russian Far East, the Korea Rural Community Corporation started to operate a support center for farming in Ussuriysk area from March 2014, for the purpose of strengthening the local network, providing technological support for extensive agriculture (including how to cultivate beans for soybean sprout), and carrying out repair tours for agricultural machinery. This type of support system needs to be spread to other regions including Southeast Asia.

In order to raise effectiveness of overseas agricultural development in the long term, securing experts on the related areas is particularly important. Currently, there are not many specialists who can provide quality consultation with companies wishing to advance

2) Establishing a post-harvest management system into which drying, processing, storage, and logistics are integrated is a strategic plan in consideration of selling prices, and the system can maximize profitability.

into overseas farmlands. While systematically fostering specialists on overseas agricultural development through degree courses at universities is necessary in the mid and long term, securing and supplying experts as soon as possible is the most urgent issue. A system that helps secure and manage specialists with expertise on target regions has to be established.

Production methods, related technology, and the distribution process for overseas agricultural development are completely different from those of domestic agriculture, as overseas agricultural development is not carried out on a small scale, but operated by commercialized farming on a large scale. Therefore, related technologies necessary for overseas farming must be provided effectively to raise productivity and operate the projects sustainably. Therefore, analyzing technologies in need by items and by regions and inducing effective strategies for technological support are a must. In addition, it is necessary to conclude a technology agreement with target countries' organizations in charge of technology and provide consultation for on-site difficulties.

Korea needs to adopt a mid- and long-term approach for overseas agricultural development, rather than to pursue short-term profitability. If operation measures with a long-term perspective are prepared by taking into consideration of support for infrastructures and technology necessary in dealings of agricultural produce or the possibility of trade with Korea and the third countries, investment in the agricultural sector will increase, while cooperative relationship with the target country is strengthening based on support for regional development and heightened joint awareness of food security.

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