Knowledge Sharing Program

2014 Modularization of Korea's Development Experience:

The Advancement of Animal and Plant Quarantine

2014

Ministry of Agriculture, Food and Rural Affairs

Animal and Plant Quarantine Agency

HANKYONG NATIONAL UNIVERSITY

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Preface

The study of Korea's economic and social transformation offers a unique window of opportunity to better understand the factors that drive development. Within about one generation, Korea transformed itself from an aid-recipient basket-case to a donor country with fast-paced, sustained economic growth. What makes Korea's experience even more remarkable is that the fruits of Korea's rapid growth were relatively widely shared.

In 2004, the Korean Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched the Knowledge Sharing Program (KSP) to assist partner countries in the developing world by sharing Korea's development experience. To provide a rigorous foundation for the knowledge exchange engagements, the KDI School has accumulated case studies through the KSP Modularization Program since 2010. During the first four years, the Modularization Program has amassed 119 case studies, carefully documenting noteworthy innovations in policy and implementation in a wide range of areas including economic policy, admistration·ICT, agricultural policy, health and medicine, industrial development, human resources, land development, and environment.Individually, the case studies convey practical knowhow and insights in an easily accessible format; collectively, they illustrate how Korea was able to kick-start and sustain economic growth for shared prosperity.

Building on the success during the past four years, we are pleased to present an additional installment of 19 new case studies completed through the 2014 Modularization Program. As an economy develops, new challenges arise. Technological innovations create a wealth of new opportunities and risks. Environmental degradation and climate change pose serious threats to the global economy, especially to the citizens of the countries most vulnerable to the impacts of climate change. The new case studies continue the tradition in the Modularization Program by illustrating how different agents in the Korean society including the government, the corporations, and the civil society organizations, worked together to find creative solutions to challenges to shared prosperity. The efforts delineated include overcoming barriers between government agencies; taking advantage of new opportunities opened up through ICT; government investment in infrastructure; creative collaboration between the government and civil society; and painstaking efforts to optimize

management of public programs and their operation. A notable innovation this year is the development of two "teaching cases", optimized for interactive classroom use: Localizing E-Government in Korea and Korea's Volume-based Waste Fee System.

I would like to express my gratitude to all those involved in the project this year. First and foremost, I would like to thank the Ministry of Strategy and Finance for the continued support for the Modularization Program. Heartfelt appreciation is due to the contributing researchers and their institutions for their dedication in research, to the former public officials and senior practitioners for their keen insight and wisdom they so graciously shared as advisors and reviewers, and also to the KSP Executive Committee for their expert oversight over the program. Last but not least, I am thankful to each and every member of the Development Research Team for the sincere efforts to bring the research to successful fruition, and to Professor Taejong Kim for his stewardship.

As always, the views and opinions expressed by the authors in the body of work presented here do not necessarily represent those of the KDI School of Public Policy and Management.

December 2014

Joon-Kyung Kim

President

KDI School of Public Policy and Management

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Summary

The purpose of this report is to review animal and plant quarantine systems in Korea: specifically, this report recounts South Korea's preparation for changes in international circumstances surrounding animal and plant quarantine brought on by the WTO regime and the SPS Agreement in 1995. This report also reviews the background, outcome and specific strategies and methods for implementation of South Korea's animal and plant quarantine policies, which produced a quarantine system of global standards in a short time. Through such a review, this report seeks to provide useful materials for developing countries when implementing animal and plant quarantine policies, as well as implications for policy makers.

1. Animal and Plant Quarantine Reinforcement Policy

Quarantine is one of the most fundamental policies for food safety and industry in South Korea. Its purposes include: (1) maintaining a stable environment of agricultural/livestock production, (2) protecting the people's health by thoroughly shutting out animal/plant-transmitted hazards such as zoonoses and hazardous substances including pesticides, (3) and minimizing conflicts with a trading country through scientific and precise inspection of sanitary and quarantine measures dictated by the WTO/SPS Agreement.

In general, the South Korean animal and plant quarantine resulted in the prevention of animal and plant pathogens and hazardous foods entering into South Korea, thereby protecting the people's lives and health.

<Animal Quarantine>

Most of the countries surrounding South Korea have suffered massive damages caused by disastrous livestock diseases, such as foot & mouth disease (FMD) and highly pathogenic avian influenza (HPAI). South Korea was inflicted with similar diseases several times after 2000. However, the country was able to prevent disasters of a national scale with its well-established infrastructure for early cleansing, and a thorough quarantine to prevent such diseases as the African Swine Feverfrom entering into its own territory.

Institutions and systems for quarantine can be qualitatively evaluated based on such indexes as efficacy, precision, speediness, and timeliness of blocking diseases/pests.

In particular, the border quarantine monitoring system was reinforced with the establishment of a computerized system capable of constantly monitoring information on diseases/pests in trading countries and real-time information sharing via international organizations and bilateral cooperation projects, which allowed for efficient diseases/pests management.

In particular, the adoption of the quarantine detection dogs system has made a considerable contribution to improving the efficacy of quarantine on small, carry-on items at airports and ports.

<Plant Quarantine>

Various types of fruit flies have generated from tropical and subtropical areas, and are now causing massive damages. The South Korean environment is not friendly to fruit flies as they cannot survive the winter. However, they may settle in crop cultivation sites, and may proliferate if they are released into South Korea from spring to autumn. Pests such as fruit flies can cause much expense and time for a preliminary investigation, and the affected country cannot export fruits until its eradication is scientifically substantiated. South Korea has been implementing rigorous preventive policies against fruit flies, including demanding refrigeration and heat treatment and other disinfection methods for fruits such as oranges, mangos and grapes exported from countries with outbreak records, and sending South Korean quarantine officers to the exporting country for quarantine, thereby successfully preventing the introduction of such pests.

2. Background and Necessity of Animal and Plant Quarantine Reinforcement Policy

In 1995, the creation of the WTO and the effectuation of the WTO/SPS agreement represented major changes that warranted the need to fundamentally change the essence of South Korea's quarantine system. This change demanded the construction of a new system to prepare for full-fledged free trade of agricultural/livestock products.

Domestically, South Korea was experiencing sophistication and diversification of food consumption patterns due to an increase in its national income, as well as an increase in the consumers' demand for safe foods. Quarantine on imported agricultural/livestock products surfaced as a major social issue as a result. South Korea, however, was not capable of actively handling the changing environment domestically and overseas, due to a lack of awareness on animal and plant quarantine, lack of the relevant systems, facilities, equipments and experts, as well as a lack of information and technology exchanges regarding international quarantine.

Substandard inspectionsled to harmful chemicals and hormones to remainon livestock products, such as beef, which added to the people's concern about imported livestock products.

In the international society, the newly adopted WTO/SPS Agreement required scientific evidence, harmonization compliance with international standards, recognition of the equivalency principle, adoption of risk assessment and transparency from SPS measures, which were utilized by each individual country as means of indirect distortion of international trade based on arbitrary criteria. This created the need for overall reform of South Korea's animal and plant quarantine measures.

Under consideration of these changes affecting animal and plant quarantine, the South Korean government established a systematic and strategic development plan to organize, improve and create an efficient method of animal and plant quarantine after internationalization and the opening of its markets.

3. Strategy and System for Implementation of Animal and Plant Quarantine Reinforcement Policy

The Five-year Plan for New Agricultural Administration was established in 1993 as a systematic response to the UR: the plan involved aid for agricultural products affected by free trade, measures for rural development and reinforcement of animal and plant quarantine functions.

The Phase 1 of the Five-year Plan for Animal and Plant Quarantine Reinforcement was aimed at establishing the basic infrastructure for handling the implementation of free trade for the next five years starting from 1992. However, the quarantine environment went through changes more rapidly than expected, so the government continued with the implementation of the plan by evaluating relevant projects during each phase, and flexibly adjusting the plan in accordance with circumstances at the time.

The key directions of the animal and plant quarantine reinforcement plan can be summarized as follows: 1) organizational and workforce reinforcement, 2) facilities and equipments expansion, 3) procuring and training of experts, 4) reinforced computerization and information, 5) ensuring efficiency of quarantine measures through such means as the adoption of quarantine detection dogs system.

4. Specific Implementation of Project Task

A. Adoption & Revision of Quarantine Systems: Harmonization Compliance of Quarantine Systems with International Regulations Including WTO/SPS Agreement

Criteria for animal and plant quarantine went through major changes after the SPS Agreement of WTO was made in 1995. In other words, animal and plant quarantine belongs to the authority of the state, but it should be handled in accordance with the international laws based on scientific justification. After the WTO regime began in 1995, the SPS Agreement took effect, which allowed each country to take scientifically justified actions to protect its people, animals and plants, as exception to the GATT.

<Animal Quarantine>

The single most important international organization in the field of animal/livestock product quarantine is the WOAH (World Organization for Animal Health, also known as OIE).

The sanitation criteria for livestock products such as beef are established by the Codex Alimentarius Commission (CODEX). As the SPS Agreement took effect in 1995, the criteria and rules contained therein were adopted as the international standards for animal quarantine and livestock products sanitation, which each member was required to adopt.

<Plant Quarantine>

The International Plant Protection Convention (IPPC) is a convention operated by the Food and Agriculture Organization under the UN, enacted in 1951 and effectuated in 1952. It is one of the most important international organizations in the field of plant quarantine. South Korea joined IPPC in 1952. IPPC is a large-scale international organization with 181 members. It was established with the purpose of preventing inflow and expansion of diseases/pests affecting plants.

B. Reinforcement of Quarantine Organization, Workforce, Facilities and Equipments

<Animal Quarantine>: Implementation of 6-PhaseProject (1992~2012)

Phase 1 of the Animal Quarantine Function Reinforcement Project was implemented as a part of the Five-year Plan for New Agricultural Administration by the Ministry of Agriculture, Forestry and Fishery, in response to the expansion of free trade of agricultural products. Its purpose was to reinforce hardware and software that were relatively inadequate.

Phase 2 through 6 Project was implemented when the WTO regime began to accelerate the proliferation of free trade in 1995, and the WTO/SPS Agreement took effect, rising as the core of conflicts surrounding animal and plant quarantine. At the time, a new system needed to be built to account for the emerging new environmental challenges, with new changes in the quarantine environment as evidenced by negotiation on agricultural trade under the new multi-lateral trade negotiation system, DDA/FTA.

<Plant Quarantine>: Expansion of Plant Quarantine Organization, Workforce and Equipments

The National Plant Quarantine Station, founded in 1978, was promoted to the National Plant Quarantine Agency in 2007. The Agricultural and Fishery Quarantine Agency was established as an organization to supervise all matters related to animals and plants and fishery products quarantine, during government reorganization in June 2011. The Plant Quarantine Division consisted of the plant quarantine department, export support department, risk management department and disaster prevention departments.

As for the plant quarantine workforce, special recruitment in the agriculture area was implemented starting from 1996 to enhance expertise of the workforce, and the researcher position was introduced in 1999 to further enhance the expertise of the organization.

C. Training of Quarantine Experts

Through overseas training for animal quarantine, experts in various fields were trained in areas such as administrative reform, international cooperation and precision inspection system. In order to acquire required technologies, employees of quarantine agencies were dispatched to overseas research institutes (for 6 to 12 months), to learn about advanced quarantine systems through short or long-term overseas technological training.

Overseas training for employees began in 1963 to foster experts in each field of plant quarantine. As a part of the UNDP 'Project for Plant Quarantine Reinforcement in South Korea' (1988~1989), employees were given the opportunity to receive training on pest classification, quarantine systems and facilities at overseas agencies. Four plant quarantine experts were invited from abroad to provide technological training on pest classification and other matters, followed by a pest investigation on major fruit trees and the publication of a report.

D. Construction of Quarantine Computerization and Information System

<Information System of Animal Quarantine>

Database construction and computerization of quarantine information was implemented to actively adjust to the rapidly changing quarantine environment that was experiencingan increasing workload and improvement of the relevant systems and laws.

The Korea Animal Quarantine Information System (KAQIS) began as a system for handling civil complaints for quarantine requests and quarantine certificate issuances. It was developed in 1995 and began operation in 1996. Later, the Automated Import Information System (AIIS) was introduced to eradicate any midmishandling of quarantine works. Starting from 1998, quarantine results were transmitted to the Korea Customs Service through the Electronic Data Interchange (EDI) to proceed with the customs procedure, which significantly increased the complainant's convenience.

The Border Quarantine Management System (BQMS) was established in 2011 to comprehensively manage livestock-related persons travelling overseas, who were identified as the major cause of the FMD outbreak in 2010.

In addition, the project for construction of the Korea Animal Health Integrated System (KAHIS), a system capable of comprehensively managing livestock diseases in South Korea in conjunction with BQMS, was implemented starting from 2008. The system began to be used in 2013.

<Information System of Plant Quarantine>

The six computer system completed from 2004 to 2007 enabled one-stop processing of the process from taking on inspection requests to issuing export/import permits by simply submitting inspection requests. This system was branded QIPS, the Quarantine Inspection Process System. QIPS reinforces customer service by improving efficiency of export/import quarantine work and providing various types of information.

In 2007, in recognition of the overall quality of exported/imported plant quarantine management, three branch stations received ISO 9001 (Quality Management Certification) from the International Standardization Organization. The ISO 9001 is considered a mark of transparency and reliability of plant quarantine services.

E. Scientification of Quarantine Methods through Adoption of Import Risk Assessment System

<Risk Assessment of Animal Quarantine>

Import risk analysis involves assessing the risks that may be caused by animal/import trade between countries, and collecting and assessing information so as to establish appropriate measures to minimize such risks when they exceed the scope tolerable by the importing country. Such analysis is mostly performed in developed countries.

Import risk assessment in South Korea consists of eight stages, including request for import permission by an exporting country, data review, local inspection, etc.

<Pest Risk Assessment for Plant Quarantine>

After the **WTO/SPS** Agreement went into effect in January 1995, the **SPS** Agreement and FAO/IPPC Agreement specifically provided for diseases/pests risk analysis. According to the outcome of the 28th **FAO** Conference held in November 1995, diseases/pests risk analysis consists of the three phases of initiation, risk assessment and risk management. The initiation phase verifies diseases/pests and their pathways. The risk assessment phase assesses whether the diseases/pests should be subject to quarantine and whether they are economically significant. The risk management phase develops, evaluates, compares and selects alternatives to reduce the risks.

F. Enhancement of Quarantine Efficiency through Adoption of Quarantine Detection Dogs, etc.

Quarantine detection dogs system refers to a quarantine method which utilizes a dog's keen sense of smell to search for livestock products such as illegal meat, processed meat, processed dairy products and processed eggs, as well as agricultural products such as fruits.

The workload of searching personal belongings of overseas travellers greatly increased due to opening of Incheon International Airport in 2001 and the World Cup Games in 2002. The quarantine organization and workforce, however, could not keep up with such rapid expansion.

In addition, the FMD outbreak in South Korea and Japan in 2000 raised the people's concern about quarantines. The FMD and HPAI outbreaks continued in surrounding countries, and an alarmingly large number of tourists, workers and trainees began to enter South Korea from those countries. These changes led to the adoption of the quarantine detection dogs system, which satisfied the need for radical changes in the existing quarantine methods that relied on the voluntary reports from travellers.

G. International Cooperation

As the only country that is recognized for its poverty-stricken history and its ability to have reached developed country status, South Korea recently has received may calls for international cooperation from developing countries regarding animal and plant quarantine.

As for animal quarantine, South Korea has actively participated in WOAH and CODEX meetings and conferences as their members, and supported quarantine infrastructure construction in developing countries such as Myanmar and Vietnam through activities of KOICA, along with animal quarantine workshops with developing countries.

Support for plant quarantine has been also provided in the form of holding workshops for Asian countries and providing travel expenses for participants from developing countries with budget separately secured for this purpose from 2006. This workshop project has been recognized as one of the most effective support mechanisms within the IPPC at each annual meeting.

This project strengthens South Korea's status in international conferences by introducing its plant quarantine systems, and improving the attitude of developing countries towards South Korea's agricultural products and quarantine systems by having them visit its research facilities, orchards, farms and fruit selection stations and distribution centers, etc.

5. Factors Behind Success of Early Advancement of Animal and Plant Quarantine and its Limitations

A. Factors behind Success

(1) Establishment and Continuous Implementation of Systematic Mid/Long-term Plans

The early advancement was made possible by comprehensive quarantine national plans for quarantine reinforcement and government-wide efforts to select and implement various projects for each phase.

(2) Awareness-raising and Foundation of Legal Basis for Harmonization with International Standards

The national consensus for revision of the systems and laws in compliance with the SPS Agreement was a factor that led to the success of the enactment/revision of the relevant systems and laws.

(3) Change of Attitudes and Formation of Social Consensus on Quarantine

Major events such as the quarantine works for the Asian Games in 1986 and Seoul Olympic Games in 1988, detection of 0157:H7 from US beef in 1997, detection of dioxin from livestock products from Belgium in 1999, brought the safety issues with imported agricultural products to the forefront, which backed up the need to establish a strong quarantine system to protect the people's health. Other incidents such as BSE in US beef in 2003, and melamine contamination of Chinese powdered milk in 2008, and the FMD and HPAI outbreaks, led to the formation of a social consensus on the importance of quarantine measures. This resulted in national support to expand financial investment fororder to e advancing the quarantine infrastructure.

Importance of plant quarantine was acknowledged widely due to an outbreak of pinewood nematode that endangered pine species and introduced other new pests. The plant quarantinehelped control cost and implement regulation prohibiting host movement.

(4) Early Securing of International-level Quarantine Expertise through Reinforced Education & Training

In preparation for expansion of free trade in 1995, South Korea made efforts to secure and train experts in the field of international trade, international cooperation and precision inspection. Short-term and long-term training at advanced research institutes in each field located in the US, France, Canada and the UK continued, which contributed to improving the quarantine system in South Korea in a relatively short time.

(5) Expansion of Financial Investment for Improving Work Efficiency Regarding Information, Computerization and Detection Dogs

In terms of information technology, the early opening of the quarantine information system (1995) and transition to the advanced computer systems were achieved through South Korea's superior Internet environment and its advanced IT capabilities. KAQIS simplified the administrative procedures for the greatly increased number of quarantine objects, enhanced work efficiency, and established a basis for providing high-quality services to the people. Computerization of the plant quarantine information was implemented starting from 1996: a system capable of on-site processing of quarantine works has been constructed utilizing the PDA system.

Adoption of the quarantine detection dogs system enhanced precision and efficacy of quarantine inspection ofillegal agricultural products that were in travelers' carry-on baggage, which had been largely left out of the quarantine system.

B. Limitations and Solutions

(1) Increase of NewDiseases

As the South Korean climate changes to a sub-tropical climate, new zoonoses such as the Ebola Virus, West Nile Fever, Hendra Virus, Schmalenbach, Nipah Virus, and new plant diseases such as *Bactrocera tryoni*, *Citrus greening* and *Candidatus Liberibacter solanacearum* emerged, increasing the likelihood of their introduction into South Korea.

(2) Limitations in Preventing Intrusion of Diseases and Pests from Surrounding Countries

It is virtually impossible to stop diseases/pests from moving into other areas all together. There is always the possibility of diseases/pests being transmitted to the adjacent areas through environmental changes, geographical situations, flow of river and ocean, wind and movement of migratory birds. Such transmission cannot be accurately predicted, thereby producing a limitation on stopping diseases/pests from moving into other areas all together.

(3) Diversification of Quarantine Level Requirements between Trading Countries

Requirements from stakeholders have also been diversified. While the demands in the past were for reinforcement of border quarantine so as to prevent the introduction of overseas livestock contagious diseases into South Korea, the current demands are for maintaining the disease-free country status and thereby expand export of the relevant livestock products.

(4) Conflicts of Interests between Importing/Exporting Countries

The position of exporting countries that worry about SPS measures being used as non-customs obstacles co-exist with the position of importing countries that worry about the people's concern about health, sanitation and environment. There is also a limit to clearly determining the scientific justifiability and legality of SPS measures, which opens up the possibility of bilateral trade conflicts at all times. Moreover, when the level of people's concern for health and environment is high, trade conflicts caused by quarantine may spiral into domestic conflicts between the government and the people, causing various social issues including distrust towards the government.

6. Implications for Developing Countries

A. Construction of Quarantine Computerization and Information System

(1) Establishment and Continued Implementation of Systematic Comprehensive Plans

Quarantine is one of the tools of government policies to be developed independently to respond to natural, industrial, political, and international trade environments, and social/cultural situations. Since most developed countries are agricultural countries, implementation of quarantine policies should be aimed at expanding export of agricultural/livestock products. Above all, it is imperative to set the future direction and establish mid/long-term comprehensive plans for such direction, and derive phase-specific tasks, so as to consolidate the government-wide will to implement the policies.

(2) Adoption of Efficient Quarantine Methods Suitable for Each Country's Reality

It would be desirable to adopt efficient quarantine methods suitable for each country's circumstances, considering that the level of economic and social infrastructure vary greatly depending on the countries. In South Korea, the early advancement of ICT's and Internet environment enabled the construction of the quarantine information system in a short time.

In addition, the level of South Korea's quarantine detection dogs system has reached the level where the country is capable of transferring its technologies to other countries considering adopting the system. Since the quarantine detection dogs system is considered a low-cost, high-efficiency quarantine method, it would be a reasonable approach to recommend the system as a new quarantine method for developing countries.

(3) Consensus on the Importance of Quarantine

The basic mission of animal and plant quarantine is to secure food safety by preventing the introduction of animals and plants disease from overseas. Therefore, the role of animal and plant quarantine should not be confined to importation restrictions to protect the country's industries: quarantine needs to be recognized as a public good that serves an important role.

B. Plan for Transferring South Korean Experiences with Animal and Plant Quarantine Policies to Developing Countries

Technology transfer and expert training through ODA projects and joint workshops and international seminars are needed.

South Korea needs to be more active in contributing to organizing such seminars as a member of animal and plant quarantine organizations such as OIE and IPPC. For example, this can be done by linking the relevant seminar topics with those from multi-lateral seminars organized by international organizations such as UNDP, FAO and APEC. Such activities will contribute to improving the national image, accumulating the related technologies, and consolidating South Korea's standing for multi-lateral and bi-lateral negotiations.

Chapter 1

Achievement and Evaluation of Animal and Plant Quarantine Reinforcement Policy

Achievement and Evaluation of Animal and Plant Quarantine Reinforcement Policy

1. History of Animal and Plant Quarantine and Scope of Research

1.1. Definition and Purpose of Animal and Plant Quarantine

Quarantine refers to detecting contagious diseases that might be transferred via transportation, persons or cargos entering or existing in the country to prevent them from spreading domestically or overseas. Its purpose is to maintain and protect the people's health.

Animal and plant quarantine refers to hygiene measures conducted during export or import, for the purpose of preventing transfer/spreading of pests and animal/plants infectious diseases, which may be transmitted via animals, plants or food produced by processing them. Each quarantine system provides the fundamental and crucial function of ensuring stability of agriculture, livestock, forestry industries of each country and consumer safety, by preventing and controlling inflow/outflow of diseases affecting animals or plants.

The top priority of any quarantine policy is to protect humans, animals and plants as well as their hygiene, for which all governments are responsible. To fulfill this responsibility, the government implements regulatory measures aimed at protecting the hygiene within its own territory from risks inherent in foods, agricultural and livestock products.

'Quarantine' originates from the mandatory 40-day mooring period enforced at the Port of Venice when the Plague ravaged Europe in the 14th Century. The word '*quarantine*' actually comes from 'quarantagiorni', which means '40 days.' Into the late 20th century, the

concept itself expanded to include measures related with hygiene inspection to check for heavy metal residues, including pesticides and colon bacteria, other than pests inspections on agricultural, livestock and fishery products, in response to consumers' demand for food safety.

Since quarantine targets exported and imported goods as previously mentioned, there is high likelihood of conflicts breaking out between the exporting country and the importing country. In fact, the number of conflicts related to quarantine measures continue to increased, along with an increase of free trade of agricultural products around the world. The international society, in order to minimize conflicts related to quarantine on agricultural products, established an international law titled the "WTO Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures," with the purpose of ensuring that the effect of actions taken by each government to protect the lives and health of people, animals and plants have minimal effect on trade of agricultural products.

1.2. Purpose and Goal of Quarantine in South Korea

Animal and plant quarantine in South Korea is a part of the nation's fundamental food safety and industry policies. Its purpose is to keep the foods safe, and protect the health of people, animals and plants, and protect the environment.

Specifically, quarantine is conducted on all animals, plants and processed livestock products imported into or exported from South Korea, under the auspices of (1) maintaining a stable environment of agricultural/livestock production, (2) protecting the people's health by thoroughly shutting out animal/plant-transmitted hazards such as zoonoses and hazardous substances including pesticides, (3) and minimizing conflicts with the trading country through scientific and precise inspection of sanitary and quarantine measures dictated by the WTO/SPS Agreement.

Inflow of harmful pests is prevented in an efficient and effective manner by border quarantine through CIQ's at international airports and ports, and exported goods are subject to quarantine that conforms to requirements of the importing country, to protect production/import by South Korean farms.

Each importing/exporting country is subject to import risk assessment consisting of hazards verification, risk assessment, risk management and exchange of risk information, as well as scientific and precise tests for clinical, serum and harmful residues, followed by appropriate measures including disinfection. Replanting or breeding plants/animals are subject to quarantine by individual cultivation, and agricultural GMO (Genetically Modified

Organisms) go through the import suitability preview. A thorough monitoring system including quarantine investigation on overseas production sites capable of continuously identifying animal/plant disease occurrences by acquiring hygiene, risk information such as foot & mouth disease and HPAI occurrences, forms a crucial basis for border quarantine management.

At the same time, in order to keep quarantine inspection from being used for distorting trade and thus causing economic loss to importing/exporting countries and entities, speedy quarantine inspection procedures are implemented based on a scientific basis, with the purpose of contributing to the revitalization of international trade.

2. Evaluation of Results of Animal and Plant Quarantine

2.1. Outcomes of Animal and Plant Quarantine in South Korea

The outcome of animal and plant quarantine in South Korea can be summarized at two levels: at a general level, reduction of overseas-originated animal/plant contagious diseases occurrences, and the resulting decrease of industrial damage suffered by South Korea.

Although animal diseases with potential of national disaster (foot & mouth disease, HPAI, etc.) are still observed, the frequency of their occurrence is very limited, especially compared with the frequent occurrences experienced by other surrounding countries, including China, Taiwan and Vietnam. Upon occurrence however, those diseases have a serious economic impact on the livestock industry, as well as related industries such as butchery and distribution. For this reason, the quarantine authority has designated 65 legal contagious diseases to be subject to extensive management. The authority has established a government-wide counter-measure system capable of activities for preventing recurrence, carrying out on-site quarantine, developing rapid diagnosis technologies, stockpiling of preventive medicines, with the consideration of the possibility of those diseases being transmitted from the surrounding countries. These efforts resulted in successful implementation of radical reforms, and South Korea is expected to secure a disease-free country designation from OIE before 2015. This represents a remarkable success, especially considering the constant foot & mouth disease breakouts in surrounding countries. Moreover, the authority has concentrated its efforts on eliminating bovine brucellosis, calf sours and miscarriages by 2015, eliminating swine fever by 2017 and eliminating other diseases, raising the expectations of successfulquarantine/prevention policies.

If pests affecting plants are transmitted from overseas, they will rapidly spread due to a lack of natural enemies in South Korea, and they will affect the overall eco system, causing economic loss and unlikely restoration. *Bursaphelenchus xylophilus* first broke out in Busan in 1988 and spread to Jeju Island, and it is still causing massive damages even today. *Corythucha ciliata*, which typically exist in North America, were transmitted to South Korea along with cargos in the 1990's, which have now spread across South Korea including to Jeju Island. These cases demonstrate the important role and function of quarantine in terms of preventing economic damage and protecting the lands and the environment.

In this context, one major outcome of South Korea's plant quarantine would be the current quarantine system that involves banning and controlling about 1,000 types of plants to shut out pests. To be specific the outcome includes preventing pests that caused serious damage in countries importing or exporting agricultural products, such as *Ceratitis capitata*, *Globodera rostochiensis*, *Radopholus similis*, *Erwinia amylovora* and *Peronospora tabacina*.

It is evident that the primary beneficiary of the quarantine system are those working in the agriculture/livestock industry, and the success of quarantine policies depends on their willingness to maintain a more stable basis for production. In other words, the level of their awareness of the importance of quarantine is a quantitative indication that allows for judging the likelihood of the policies' success. As for the BQMS, the percentage of exit/entry reports by livestock-related persons, enforced under the said system, has reached 99.7~99.9% as of 2011. This represents the level of awareness and can be regarded as one of the major outcomes achieved by reinforcing the BQMS.

The above systems represent the development of systems focused on the workers' obligations and responsibilities rather than government-led quarantine, by inducing them to voluntarily submit reports upon entry/exit so as to prevent inflow of pests affecting animals/plants. The workers need to recognize that an outbreak of animal diseases with potential risk of national disaster may be caused by an oversight of production farms.

Awareness of the importance of animal and plant quarantine has been instilled in the minds of the general public, as well as those in the agriculture/livestock industries, forming a social consensus that opens up the possibility of expanding government investment in reinforcement of the quarantine system and its scientification. As the general public became more concerned about possible issues caused by free trade after the WTO Uruguay Round in 1993 and the Free Trade Agreement, the government has come to establish government-wide plans, and expand financial investment in animal and plant quarantine with the cooperation of related departments. A total of 134 billion Korean Won (KRW) was invested in animal

quarantine from 1992 to 2008, while 220.1 billion KRW was invested in plant quarantine during the same period. With a sizable expansion of financial investment, South Korea could achieve systematic refinement of its quarantine systems and establish a scientific basis that conform to international laws after the Uruguay Round.

Table 1-1 | Scale of Government Investment in Animal and Plant Quarantine

Years	'92~'95	'96~'97	'98~'00	'01~'04	'05~'08	'09~'12
Animal Quarantine	10.2	11.3	45.7	28.2	38.7	47.2 million Won
Plant Quarantine	4.8	10.5	38.1		166.7 million Won	

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Outcomes achieved by quarantine in terms of public health protection include protection of the public's health through prevention of China-originated contagious diseases such as SARS and HPAI.

Outbreak of avian influenza that terrorized Asia, as well as the entire world, was followed by BSE, which affected some 190 thousand animals in 25 countries after it emerged in the UK in 1985; West Nile Fever which originated from the US in 1999 and caused serious issues in North America; Nipa Virus Infection which originated from Bangladesh, affected hundreds of people with a mortality rate of 40%; and SARS, which hit China and Hong Kong in 2003; among other new diseases of a national disaster scale. The fact that these diseases were kept out of South Korea by quarantine measures, including rapid data collection, shows the effectiveness of the reinforced quarantine system.

In terms of trade facilitation, South Korea achieved quantitative growth that ensured the capability to process a rapidly increasing amount of products after 1995. After the Uruguay Round and FTA, before fully opening up the market, South Korea implemented the quarantine reinforcement policy. Through this policy, South Korea established a system capable of smooth and rapid processing of quarantine inspection on exported/imported goods, the amount of which grew continuously after 1993.

The volume of livestock products trade in South Korea is on the rise, in keeping with the trend of free trade and economic growth. In 1990, the year when the plan for animal quarantine advancement was established, the number of countries trading with South Korea was 58, with 32,000 quarantine cases. After ten years, however, the number of trading

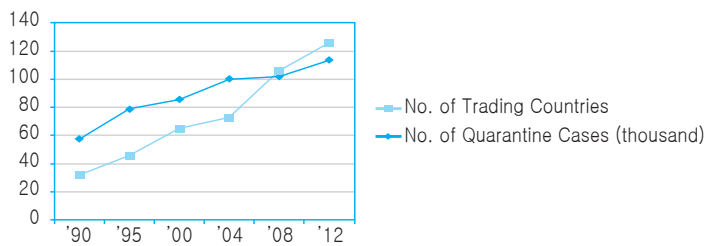
countries increased to 86 with 65,000 cases in 2000, and to 114 countries with 126,000 cases, with increasing speed. This trend is expected to continue in the future.

Plant quarantine is characterized by the large number of items to inspect and the wide variety of pests subject thereto. Also, the variability of harms caused depending on the climate and ecology requires precise risk analysis. In plant quarantine, almost all items are personally sampled by plant quarantine officers on site for visual inspection, and the suspected samples or samples subject to precision inspection go through inspections at the relevant labs. These processes require a lot of time and workforce, as well as a high level of expertise.

About 80,000 quarantines were conducted on about 1,000 items imported from around 100 countries (21,161,149,000 tons in total) in 1996: in 2012, 4,132,000 quarantines were conducted on about 2,700 items imported from 150 countries (52,784,842,000 tons in total). The number of countries increased 1.5-fold, while the number of quarantine cases increased 52 times. The number of items also increased 2.7 times, which represents quantitative and qualitative growth in terms of both complexity and diversity. In addition, wooden packaging materials, immigration cargos and used cars also were subject to plant quarantine, to prevent possible ingress of pests/diseases through imported goods other than plants.

Table 1-2 | Changes in Livestock Products Trading Countries and Quarantine Cases

Classifications	'90	'95	'97	'00	'04	'08	'12
Number of Trading Countries	58	79	83	86	100	101	114
Quarantine Cases (thousand)	32	46	44	65	73	106	126

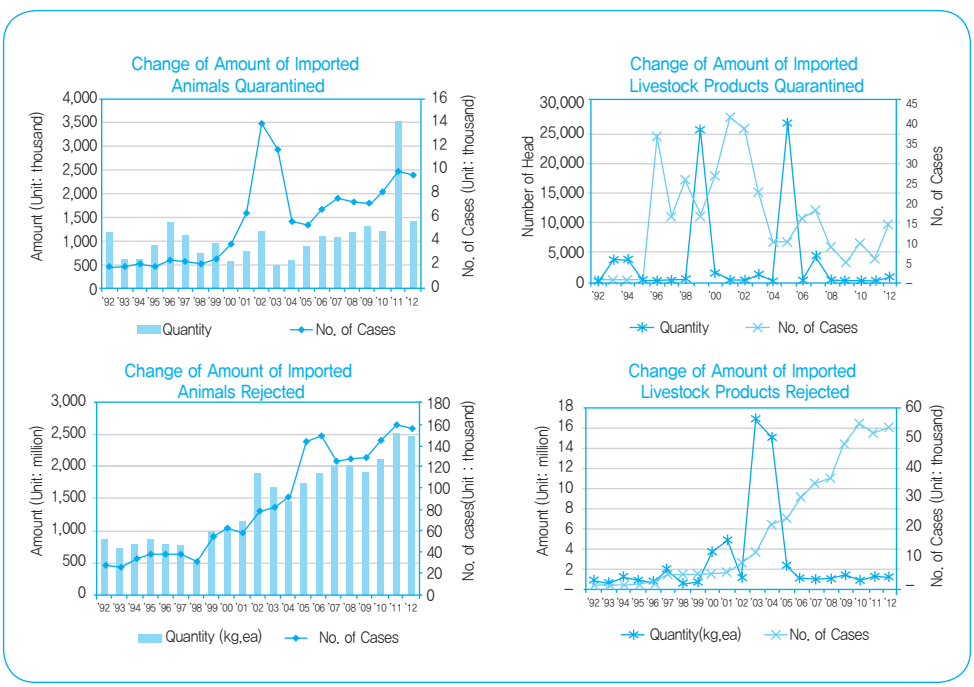


Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Along with trading countries and quarantine cases, the number of FTA's signed was also increasing. South Korea is one of the most well-known beneficiaries of the multi-lateral trading regime: the country achieved economic growth mainly through trade with other countries. Starting with the South Korea-Chile FTA signed on April 1st 2004, South Korea signed FTA's with Singapore, EU (28 member states), ASEAN (10 member states), India, Peru, the US and Turkey, with ongoing negotiations for FTA's with Indonesia, China, Vietnam and New Zealand. This increase signifies the further opening of South Korea's agricultural/livestock industries, and considering the current situation where South Korea is one of the countries that depends on imported agricultural products, the demand for quarantine of imported animals/livestock products is expected to greatly increase compared with other service products and manufactured goods.

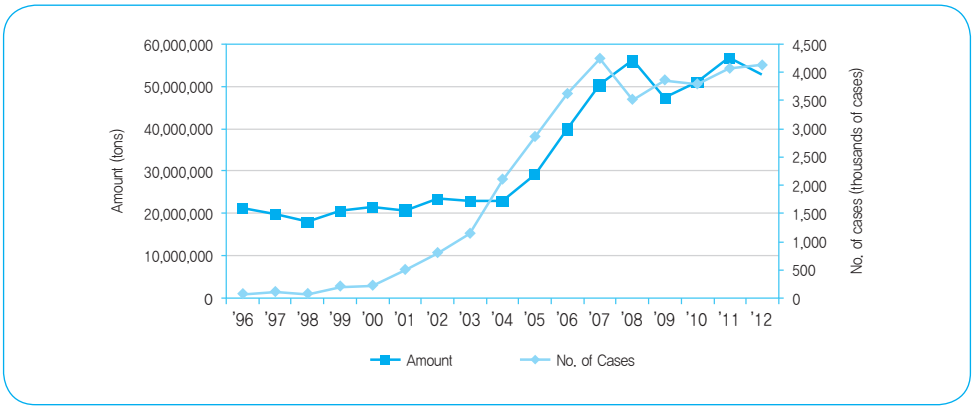
Firmly establishing the quarantine system capable of achieving a stable supply of agricultural products even under the expansion of export/import volumes and facilitating international trade can be regarded as one of the defining outcomes of the quarantine reinforcement policy implemented as of 1995.

Figure 1-1 | Change of Number of Quarantines and Rejections of Exported/ Imported Animals and Livestock Products



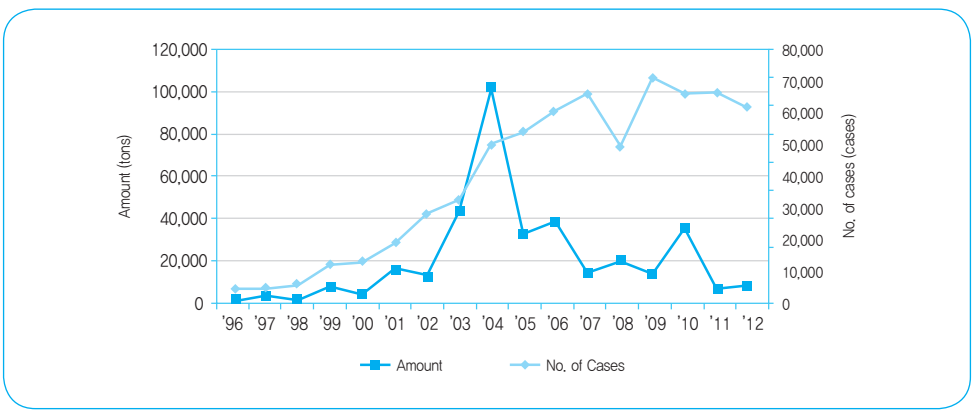
Source: National Veterinary Research and Quarantine Service (NVRQS), 'Annual report 1986~2012).

Figure 1-2 | Change of Amount of Imported Plants Quarantined



Source: National Plant Quarantine Agency, Plant Quarantine Yearbook (1996~2012).

Figure 1-3 | Change of Amount of Imported Plants Rejected



Source: National Plant Quarantine Agency, Plant Quarantine Yearbook (1996~2012).

In addition, the South Korean quarantine system itself, which fully conforms to international standards, can be listed as one of the outcomes of the advanced quarantine policy. As for animal quarantine, South Korea revised the Enforcement Decree of the Livestock Diseases Prevention Act, specifying the situations that require certification from the exporting country, so as to prevent transmission of animal disease pathogens through import of designated products (1985). In response to allowing the import of livestock products, the Decree was further revised in 1991 to specify the situations that

require certification from the exporting country to protect South Korea's livestock industry and ensure safety of the people. In addition, the Livestock Disease Prevention Act was revised in 1995 to allow for specifying sanitary conditions, including sanitary situations and quarantine specifications at the importing country on the quarantine certification, if required for public sanitation and animal disease prevention, in response to diversification of the import paths and free trade. The Act was further revised in 2008 to conduct import risk analysis on the possibility of contagious disease outbreaks caused by the import of the quarantined products, while attempting to lift bans on imports in certain regions or lift bans on the import itself. The revised Act further provided mandatory public notification of the method of import risk analysis and other matters required for the procedures.

Such efforts to bring the South Korean quarantine system closer to the WTO/SPS will result in a reduction of conflicts that might occur in relation to sanitation and trade. To this end, South Korea has been actively participating in animal/plant diseases and sanitation investigations conducted in each trading country, as well as bi-lateral or multi-lateral quarantine-related international activities to have South Korea's characteristics and scientific grounds considered for inclusion among other international standards. These efforts were to expand the basis for having the position of countries depending on imported agricultural goods properly considered in the international society.

○ Operation of Sanitation Conditions for Imported Goods

· ('01) 25 countries/53 conditions → ('02) 29/61 → ('03) 29/65 → ('08) 28/76 → ('12) 30/82[20% ↑/55% ↑)

○ Operation of Sanitation Conditions for Import of Banned Goods

· ('94) 1 country/53 conditions → ('12) 23 countries/27 items, 44 conditions

○ Sanitation Conditions for Exported Plants 15 countries/54 items/130 conditions

2.2. Qualitative Evaluation of Animal and Plant Quarantine in South Korea

Institutions and systems for quarantine can be qualitatively evaluated based on such indexes as efficacy, precision, speediness, and timeliness of pests blocking. Evaluation of the levels and results of quarantine inspections currently conducted in South Korea shows a steady increase of the number of inspected items and the rejection rate despite a rapid increase of items to inspect after opening up the market. South Korea has achieved a developed country-level of efficacy, precision and speediness through bold investment in securing

expert inspection personnel and advanced equipments. In particular, the border quarantine monitoring system has been reinforced through the establishment of a computerized system capable of constantly monitoring pests information in trading countries and real-time information sharing via international organizations and bilateral cooperation projects, which allowed for efficient pests management.

The list of diseases subject to quarantine has been expanding since 1995 so as to improve the efficacy of blocking of pests affecting animals and plants, and the number of residue substance inspection items and food/microorganism inspection items tripled from before the markets were opened, ensuring the capability to monitor even substances that can harm the people's health.

Table 1-3 | Change of Precision Inspection on Animal and Livestock Products

- Inspection for Contagious Diseases · ('92) 23 types → ('12) 41 types [89% ↑]
- Residue Inspection · ('92) 23 types → ('12) 204 types [257% ↑]
- Food Microorganisms Inspection · ('92) - types → ('12) 17 types

Source: National Veterinary Research and Quarantine Service(NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Table 1-4 | Pests Designed to be Subject to Plant Quarantine

- No. of Precision Inspection Items · ('6) 39 types → ('12) 73 types [187% ↑]
- No. of Pests Subject to Control · ('6) 1,005 types → ('14) 1,495 types [149% ↑]
- No. of Pathogens Subject to Control · ('96) 330 types → ('14) 454 types [138% ↑]
- No. of Pathogens Subject to Control · ('96) 5 types → ('12) 20 types [400% ↑]
- Pests Not Subject to Quarantine · ('96) - → ('14) 49 types

Source: National Plant Quarantine Agency, Plant Quarantine Yearbook(1996~2011).

Efficacy and precision of quarantine policies were ensured through the expansion of the quarantine organization, work force, facilities and equipments, acquisition of quarantine inspection experts and improvement of inspection technologies, establishment of the quarantine detection dogs system and modernization of quarantine facilities.

Table 1-5 | Change of Facilities and Equipment for Animal and Livestock Product Inspection

○ Modernization of quarantine facilities, including Yeongjongdo Quarantine Station, Incheon Airport - Area of quarantine facilities (thousand m²) ('92) 22 → ('12) 167 (659% ↑) ○ Sealed Laboratory ('01), Seoul ('96)·Busan Branch ('97) Laboratory Construction ○ Modernization of quarantine equipments (number of equipments retained) ('92) 696 → ('12) 3,700 (432% ↑)

Source: National Veterinary Research and Quarantine Service(NVRQS),'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Table 1-6 | Change of Facilities and Equipment for Plant Quarantine

○ New Buildings after 1995 - Center Building at Incheon International Airport (1542m²), Gimpo Airport Office (138m²), Goseong Office (59m²), Sokcho CIQ Office (205m²), Central Region Office (2,840m²), Anyang Office (228m²), Pyeongtaek Office (104m²), Cheongju Office (320m²), Cheonan Office (140m²),Yeongnam Regional Agency (952m²), Sinseongdae Office (238m²), Daegu Office (135m²), Gumi Office (65m²), Gimhae Airport Office (160m²), Changweon Office (187m²), Ulsan (382m²), Honam Regional Agency (1518m²), Muan Office (118m²), Gwangyang Office (301m²), Jeju Regional Agency (830m²), Jeju Airport Office (176m²), Plant Quarantine Technology Center (668m²), Gimhae Office (607m²)

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

In particular, adoption of the quarantine detection dogs system has made a considerable contribution to improving the efficacy of quarantine on small, carry-on items at airports and ports. Detection by highly-trained detection dogs is crucial in improving the quality of border quarantine, in terms of thoroughly shutting out pests affecting animals and plants transmitted through small, carry-on items rather than large-sized imported/exported goods, which increased due to an increase of overseas travelers and tourists.

Table 1-7 | Change of Number of Quarantine Detection Dogs in Operation and Number of Detections

- Number of Dogs in Operation: ('01) 2 → ('12) 18 [800% ↑]
- Number of Detections: ('02) 1,862 → ('12) 22,399 [1,103% ↑]

Source: National Veterinary Research and Quarantine Service(NVRQS), 'Quarterly magazine vol 15 (2002), Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Considering the current high dependency on imported agricultural/livestock products, the relevant policies must consider sustaining a stable supply of safe agricultural products, for the purpose of protecting the people's health. Since sanitation and safety in the exporting country is directly related to the safety of South Korean citizens, implementation of overseas on-site quarantine is regarded as a policy capable of accomplishing food security for the people and protectthe people's health. Establishment of the Sanitation Information Department (Import Risk Evaluation Department) in 2006 is deemed to have laid down the practical groundwork for enhancing expertise for collecting sanitation information and import risk evaluation.

Table 1-8 | Change of Regions Subject to Local Plant Quarantine Overseas

- Countries subject to on-site quarantine: ('01) 4 countries → ('02) 5 countries → ('04) 7 countries → ('12) 16 countries [300% ↑]
- Number of items subject to on-site quarantine: ('01) 7 items → ('02) 8 items → ('04) 8 items → ('12) 15 items [114% ↑]

Source: National Plant Quarantine Agency, History of Plant Quarantine (2013).

Speediness and timeliness of quarantine can be evaluated based on the stand-by time and processing time. The computer/information system for quarantine has improved continuously since 1996. Starting with the establishment of the computer/information system in 1996, the Korea Animal and Plant Quarantine Information System (KAQIS) was constructed in 1996, followed by the Automatic Import Information System (AIIS) in 1997, the Laboratory Information Management System (LIMS) in 2001, the penalty management system for systematic management of non-compliance records (August 2006), the establishment of the overseas quarantine information system (October 2007), and the establishment of the simplified notification system for rejected quarantine items sent via mail (February 2008).

These efforts have been supplemented with continuous reinforcement of the work force. The number of animals/livestock quarantine personnel was 159 in 1990, of which the number of animal quarantine personnel was 94. The number increased to 159 in 1992, 203 in 1995, 449 in 2000 and 628 in 2012. To compare the number of personnel with the number of quarantine cases at the time, the number of quarantine cases handled by each personnel in 1995 was 2,230, which changed to 1,450 in 2000 and 2,010 in 2012. Considering the 4-fold increase of quarantine items for each product over the years, the increase of quarantine cases handled by each personnel implies a rapid improvement of the level of automation/computerization at quarantine sites.

The load of quarantine works after the opening of the market can be more clearly identified by looking at the number of plant quarantine cases each year. The number increased from 71 thousand in 1993 to 4.2 million in 2012, showing a 60-fold increase. Likewise, the number of cases handled by each personnel rose steeply from 430 to 12,660, with little change in the stand-by time and processing time: this indicates considerable development of both quantitative processing capabilities and quality of services.

Table 1-9 | Work Force Increase Due to Increased Animal Quarantine Workload

Animal Quarantine	'95.	'00.	'04.	'08.	'12.	'13.08.
Quarantine Cases (hundreds)	460	650	730	1,060	1,260	720
Number of Cases Handled per Personnel (10)	223	145	141	181	201	302
Quarantine Workforce (persons)	203	449	518	585	628	464
Quarantine Workforce Increased by (persons)	44	151	69	67	43	△164

Plant Quarantine	'93.	'00.	'06.	'12.
Quarantine Cases (hundreds)	710	3,059	37,070	42,053
Number of Cases Handled per Personnel (tens)	43	107	1,093	1,266
Quarantine Workforce (persons)	164	284	339	332

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6), National Plant Quarantine Agency, Plant Quarantine Yearbook (1980~2011), Animal and Plant Quarantine Agency, Plant Quarantine work manual (2013).

Chapter 2

Background and Necessity of Animal and Plant Quarantine Reinforcement Policy

Background and Necessity of Animal and Plant Quarantine Reinforcement Policy

1. History of Animal and Plant Quarantine and Scope of Research

1.1. History of Animal and Plant Quarantine

Animal quarantine was first implemented in 1909, during Japanese colonization, with the announcement of the Act on Quarantine for Imported Cattle. The Japanese authority at the time, after verifying cattle disease from cattle exported to Japan, set up quarantine stations at exporting ports in Korea to implement quarantine on exported goods. The first quarantine system was followed by quarantine targeting cattle exported to Russia and Japan. Into the 1930's, however, quarantine for imported goods began along with first import of horses from Mongolia and sheep from Australia. The quarantine station changed its name to Busan Livestock Quarantine Station after the Korea's liberation in 1945. Despite a donation of livestock animals from overseas, the Station at the time did not match its title in its function and roles.

As the Korean society stabilized after the Korean War and the Armistice Agreement in 1953, various animals including cows, oxen, seed pigs, sheep and rabbits were exported from the United States as aid for war refugees. The Korean quarantine system was not ready for the imports, and South Korea depended on quarantine certificates and clinical investigations conducted by another country. The quarantine station changed its name to the National Animal Quarantine Station in 1962.

As for the legal scheme, the Livestock Disease Prevention Act was enacted in 1961, followed by the Standard for Quarantine Station Designation for Exported Goods in 1963 (by the Ministry of Agriculture and Forestry), and the systematic quarantine system was established with the enactment of the Quarantine Methods and Standards for Exported/ Imported Goods Designated for Quarantine.

As for the import sanitation conditions, the first quarantine standards established for cattle and cattle products from Australia in 1967 was used as the common import sanitation conditions for artiodactylous animals and relevant products from the Unites States, Canada, Australia, New Zealand, Japan and Taiwan. As the pattern of livestock disease occurrence changed in each country, the countries came to enact and enforce their own import sanitation conditions, and established their own frameworks for import sanitation conditions. When promotion of the livestock industry was included in the Five-year Plan for Economic Development implemented in 1962, the import of cattle from the US, Australia and New Zealand rapidly increased from 1962 to 1985. When economic growth resulted in a higher demand for beef, the government began to import beef to stabilize prices. At this juncture, the National Animal Quarantine Station established itself as South Korea's quarantine station for imported/exported animals and livestock products.

Quarantine works for the Asian Games in 1986 and the Seoul Olympic Games in 1988 did much to bring the level of animal quarantine in South Korea to an international level. This was followed by the creation of a new environment for animal quarantine by the Uruguay Round negotiation where the participating countries agreed to minimize the negative impact of sanitation and quarantine regulations on trade of agricultural products. Faced with these changes, the Animal Quarantine Station brought together quarantine plans that were individually implemented into the Five-year Project for Reinforcement of Animal Quarantine Function in 1992, which was implemented since that year and raised South Korea's animal quarantine standards to the level of a developed country as of 2014.

1.2. History of Plant Quarantine

The history of plant quarantine can be divided into three periods: Birth (Japanese Domination~1977), Leap Forward (1978~1994), and Advancement (1995~2014).

Birth: When the import of Japanese cherry trees and fruit saplings increased in the early 1910's under the Japanese colonial rule, the Japanese Government General enacted the "Official Joseon Customs Rates" on December 17th 1912, based on which the first quarantine was conducted on imported plants. The Rules on Pest Aid and Prevention was

enacted and announced as Government General Order No. 1 in 1913. The Enforcement Rules on Imported/Exported Plant Quarantine in Joseon, enacted in 1933, established the framework of plant quarantine in Korea. The 13 years after liberation in 1945 to 1958 was a time of national turmoil: plant quarantine was suspended accordingly during this period, but resumed in 1959 as imports of agricultural products increased due to the provision of aid from the United States and the UN. The Plant Quarantine Act was enacted in 1961 as the first plant quarantine law in South Korea, and the plant quarantine work resumed in 1962 with 20 personnel newly recruited. In September 1965, an organization of the Ministry of Agriculture and Forestry was revised to setup the Plant Disease Prevention Department under the Bureau of Agricultural Production, which would supervise the general matters regarding quarantine on imported/exported plants.

Leap Forward: When imports of agricultural products from overseas increased in the late 1970's ([Figure 1-1]), the National Plant Quarantine Station was established on April 12th 1978, as the first independent organization for plant quarantine in South Korea. During this period, the focus was on establishing the quarantine administration system, along with refining the organization. The five dispatched stations were promoted to branch stations in September 1979, followed by partial adjustment of tasks under taken by each department in preparation for the World Trade Organization (WTO), and expansion of the organization to six departments, so as to supplement the counter-pests functions ([Figure 1-2]). Laws related with plant disease prevention were revised 22 times from 1978 to 1994, to resolve issues related to the operation of the system and improving the quarantine system. In 1984, in preparation for the 1986 Asian Games and 1988 Seoul Olympic Games, the facilities/equipments modernization plan was established and a total of 1 billion and 60 million KRW was invested over three years by 1986 (<Table 1-5>). The pests control system was further improved in 1993, with the adoption of the legal distinction between borderline pests, restricted pests and controlled pests. This ensured a more precise and systematic pests control.

Advancement: The WTO regime began its activities in January 1995: in response, the South Korean government fully revised the Plant Disease Prevention Act after 35 years since its enactment. With this revision, the Plan for quarantine function reinforcement was implemented in three stages, and a total of 53.4 billion KRW was invested from 1993 to 2006. Ten researchers were employed in May 1999 followed by an additional 184 personnel between 1995 and 2007 for the purpose of securing a quarantine workforce and expertise (<Table 1-3>): the recruited researchers had master's degrees or higher, and honors graduates from relevant majors could be employed through special recruitment (<Table

1-4>). Negotiations for quarantine requirements for exported/imported agricultural products expanded after the WTO regime, and negotiations were completed to permit for exporting 56 items 137 cases to 18 countries and importing 28 prohibited items 48 cases from 25 countries as of 2014. In keeping with IT development and the advent of the knowledge and information period, a modernized information communication network was constructed, which includes on-line requests for inspections and an electronic health certification system.

1.3. Scope of Research on Animal and Plant Quarantine

Animal and plant quarantine in South Korea is recognized for having achieved quantitative and qualitative improvements in a relatively short time. The purpose of this research is to systematically analyze and summarize the outcome and progress of quarantine in South Korea, thereby proposing directions for developing countries when establishing quarantine policies and applying them to the actual cases in a way appropriate for its own environment and situations.

Therefore, the period covered by this study is limited to 20 years from 1992, when South Korea began to refine its quarantine system, and 2012: this study will analyze and systematize each field and stage during this period, to provide support for developing countries preparing their own animal and plant quarantine systems.

In addition, the study will analyze strengths and weaknesses (causes of failure) in each area developed and operated in South Korea to derive the strengths of South Korea's quarantine system and identify an area with sufficient competitive edge, so that these cases could be used as benchmarking cases that will help developing countries renew their attitude towards animal and plant quarantine and reduce errors when applying the policies to actual cases.

2. Status of Animal & Plant Trade and Domestic/Overseas Quarantine Situation at the Time of Adoption of Policy

Due to the widening of the market opening, as exemplified by the inflow of low-priced agricultural/livestock products from China and phased transition to free trade after suspending the GATT/BOP in the mid-1980's, the volume of animal and plant quarantinegreatly increased and the domestic/international circumstances around animal and plant quarantine went through drastic changes, including the diversification of imported agricultural/livestock products and exporting countries.

- Change of quarantine cases and volume

Number of animal quarantine cases	('80)	9,833	→	('90)	31,904	324% increase
No. of Plant Quarantine Cases	('80)	30,000	→	('90)	61,424	235% Increase
Animal Quarantine Volume	('80)	261,878 M/T	→	('90)	759,195 M/T	290% increase
Plant Quarantine Volume	('80)	5,825,165 M/T	→	('90)	13,046,472 M/T	224% increase

- Change of quarantine items ('80) 1200 types → ('90) 2,350 types

- Change of number of trading countries ('80) 80 countries → ('90) 115 countries

In particular, as full-fledged opening of the market was expected after the GATT/UR negotiation closed, the quarantine volume was expected to keep going up at a rapid pace.

Meanwhile, domestically, growth of the national income led to increased demand from consumers for more refined, diverse and safer food products: the issue of quarantine on imported agricultural/livestock products surfaced as a crucial social issue, and it became more crucial to ensure sanitation and animal and plant quarantine. South Korea, however, was not capable of actively handling the change of environment both domestically and overseas, due to a lack of awareness on animal and plant quarantine, lack of the relevant systems, facilities, equipments and experts, as well as a lack of information and technology exchanges regarding international quarantine.

In particular, thorough quarantine had not yet been achieved in terms of protecting the people's health domestic animals and plants from imported agricultural/livestock products (standard for harmful antibiotics, pesticide residues and heavy metals and malignant livestock diseases and pests). This led to concerns about the level of protection for people's health and animals/plants in South Korea, especially with the expansion of free trade and dependency on overseas products.

- Residual pesticide (alar) detected from imported grapefruits.

- Cancer-causing substance (daminozide) detected from imported apple juice.

- Cancer-causing pesticide detected from animal feed imported from the US.

- Cancer-causing substance (aflatoxin) detected from corn imported from the US.

Also, at the time, after a new agreement was made on SPS (sanitary and phytosanitary) measures during GATT/UR negotiation for agricultural products, SPS was subject to a different strain of international regulations. This warranted the need to overhaul the system of animal/plant sanitation/quarantine measures in South Korea.

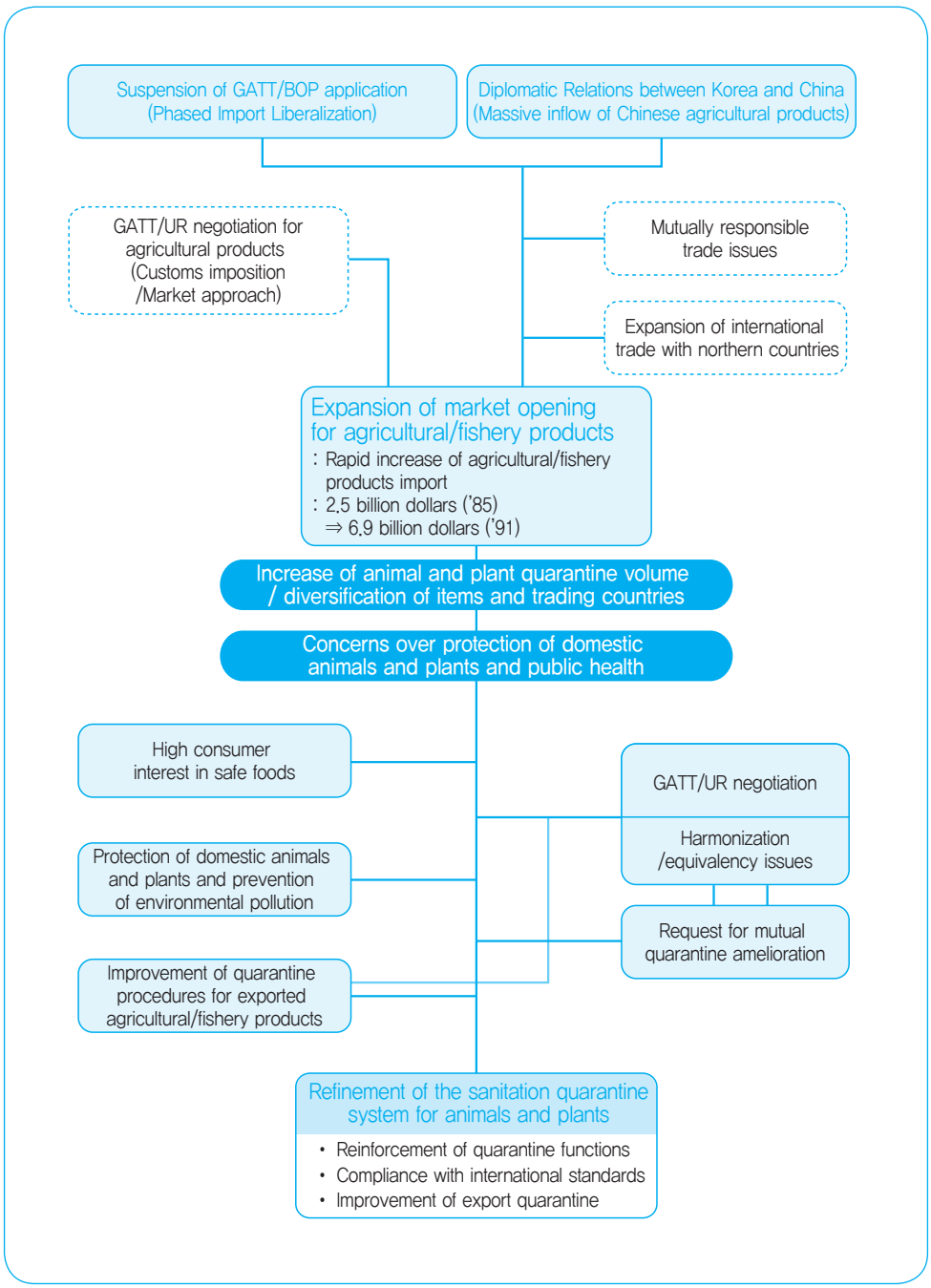
- Harmonization with international standards
- Equivalency principle
- Risk assessment
- Adaptation to regional condition
- Transparency

Under this agreement, it is now possible to expect amelioration of SPS regulations of the country that raises objections to South Korea's sanitation quarantine, provided that South Korea submits scientific and objective quarantine data. Thus, South Korea needed to improve its export quarantine system so that it was capable of meeting quarantine conditions of the importing country, to promote and secure exports of agricultural/livestock products.

- Counter plans against risk assessment by trading countries
- Simplification of export quarantine procedures and development of local quarantine

Considering these changes that affected animal and plant quarantine, the South Korean government established a systematic and strategic development plan to organize, improve and create an efficient method of animal and plant quarantine after internationalization and the opening of its markets.

Figure 2-1 | Change of Domestic/Overseas Situations Affecting Animal and Plant Quarantine



Source: Korea Rural Economic Institute, Change of circumstance surrounding animal and plant quarantine and counter plan (1993).

3. Major Factors for Adoption of Animal and Plant Quarantine Reinforcement Policy

As previously mentioned in Chapter 2.2, free trade of agricultural products after the GATT/UR negotiation, agreement on SPS measures regarding animals and plants quarantine, high demand for safe food due to an increase of national income, among other factors, have created the need to fundamentally change the core of South Korea's animals and plants quarantine system.

A 1993 study commissioned to an external research institute revealed the following problems with South Korea's animal and plant quarantine.

3.1. Issues Related with Institution and Organization Management

① Redundancy and Unclearness: Quarantine inspection for imported agricultural/forestry/fishery products is undertaken by both the Ministry of Welfare and the Ministry of Agriculture and Forestry.

② Lack of Institutional Reform to Prepare for Internationalization: Lack of efforts to comply with international standards provided by the GATT/UR SPS Agreement, establish exported/imported plans under the equivalency principle, adopt and operate risk assessment systems, and refine the systems after reduction of pests regions.

③ Lack of transparency: Lack of open procedures to collect opinions for revision.

④ Lack of efforts to ensure flexibility and efficiency: Absolute lack of organization, workforce, facilities and equipments to handle diversification of importing countries, items and increase of import volumes.

⑤ Lack of use of local quarantine systems: Need to create solutions to overcome limitations of the quarantine system at the target region.

3.2. Issues Related with Organization, Work Force, Facilities, Equipments, Technologies and Information

① Lack of experts and training thereof: Quarantine depends on experts with accumulated skills.

② Lack of quarantine facilities and equipments: Lack of space, equipments and facilities for quarantine.

③ Lack of quarantine technologies and information: Under-developed technologies and research functions.

3.3. Cooperation System with Quarantine-related Agencies

① Lack of technological cooperation with expert organizations, such as Universities Solution of the issue of insufficient experts

② Lack of pests monitoring/cooperation system: Lack of prevention system

③ Lack of cooperation system with related bodies, such as the Customs Service

Amid these multiple strain of changes, the government established and implemented the Five-year Plan for Animal and Plant Quarantine Reinforcement (1992~1996), faced with free trade of animal/livestock products and diversification of trading countries.

Chapter 3

Strategy and System for Implementation of Animal and Plant Quarantine Reinforcement Policy

Strategy and System for Implementation of Animal and Plant Quarantine Reinforcement Policy

1. Implementation Strategy

1.1. Establishment of Comprehensive Mid/long-term Development Plans

South Korea's quarantine policies, before establishment of the Plan for Animal and Plant Quarantine Reinforcement in 1993, mainly consisted of ad-hoc solutions to individual issues that lacked a systematic approach. In 1995, the creation of WTO and effectuation of the WTO/SPS agreement represented major changes that warranted the need to fundamentally change South Korea's quarantine system.

Accordingly, the government established a comprehensive plan to prepare for the UR regime. The Five-year Plan for New Agricultural Administration was established in 1993, which involved aid for agricultural products affected by free trade, measures for rural development and reinforcement of animal and plant quarantine functions.

<Animal Quarantine>:

The first Five-year Plan for Animal and Plant Quarantine Reinforcement was aimed at establishing the basic infrastructure to handle the implementation of free trade for the next five years starting from 1992. However, the quarantine environment went through changes more rapidly than expected, so the government shortened the project period by one year and implemented each stage of the project. After continued evaluation, supplementing and taking into consideration those evaluations and environmental changes, the seventh project has been in operation as of 2014.

These comprehensive mid/long-term projects for quarantine reinforcement formed the national consensus, consolidated cooperation between stakeholders, and drew out cooperation from the related bodies, thereby contributing to the early achievement of a stable workforce, facilities and equipments in a steady manner.

(1) Years of Implementation and Scales of Investment for Each Phase

Classifications	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Implementation	'92~'95	'96~'97	'98~'00	'01~'04	'05~'08	'09~'12
Scale of Investment	10.2 billion KRW	11.3 billion KRW	45.7 billion KRW	28.2 billion KRW	38.7 billion KRW	46.5 billion KRW

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

(2) Key Areas of Investment

- Expansion of quarantine organization, workforce, facilities and equipments
- Securing of expert workforce for quarantine inspection and improvement of inspection skills
- Construction of quarantine computer network and information system
- Settlement of the detection dogs system

< Plant Quarantine>

Establishment of the Plan for Plant Quarantine Reinforcement was motivated by the WTO/SPS in 1995.

Phase 1 (1993~1995): 4.8 billion KRW invested in refining quarantine systems to be compliant with the international laws and prepare for expansion of free trade after completion of the UR negotiation.

Phase 2 (1996~1997): Basis for scientific quarantine secured to prepare for the WTO regime, 10.5-billion investment made

Phase 3 (1998~2006): Advancement of plant quarantine for the 21st century, 38.1-billion investment made

The goals of Phase 1 and 2 were as follows: expansion and reorganization of stations and branch/dispatched stations, workforce reinforcement to handle increased quarantine volume, fulmination facilities for facilities and equipments modernization, securing of advanced equipments and an independent office building, construction of the basis for quarantine

computerization, improvement of pests control system and reinforcement of the imported plants management system. The goals of Phase 3 were: extensive preparation of software to ensure quarantine capabilities and expertise of plant disease prevention officers and making investments in hardware such as quarantine organization, workforce, facilities and equipments to satisfy demand. The total investment made during Phases 1~3 was 53.4 billion KRW. Of this amount 29% went to quarantine facilities (15.4 billion), 32% went to quarantine equipments (17.2 billion) and 39% went to research and other projects (20.8 billion).

Table 3-1 | Current Status of Implementation of Plant Quarantine Reinforcement Project

(Unit: million Won)

Items	1992	Phase 1~2 (1993~1997)		Phase 3 (1998~2006)		Total	
		Volume	Amount	Volume	Amount	Volume	Amount
Workforce Increase (persons)	230	103	-	100	-	433	-
Facilities Expanded (m^2)	11,907	3,692	2,091	20,570	8,469	111,396	15,400
Equipments Reinforced (units)	284	928	6,726	1,555	10,474	2,767	17,200
Technological Training (persons)	-	270	93	766	690	1,036	783
Research (cases)	-	-	-	204	3,708	204	3,708
Computer System, etc. (units)	293	147	708	442	3,835	735	4,503
Miscellaneous Projects	-	-	882	-	10,924	-	11,806
Total	4,800	-	10,500	-	38,100	-	53,400

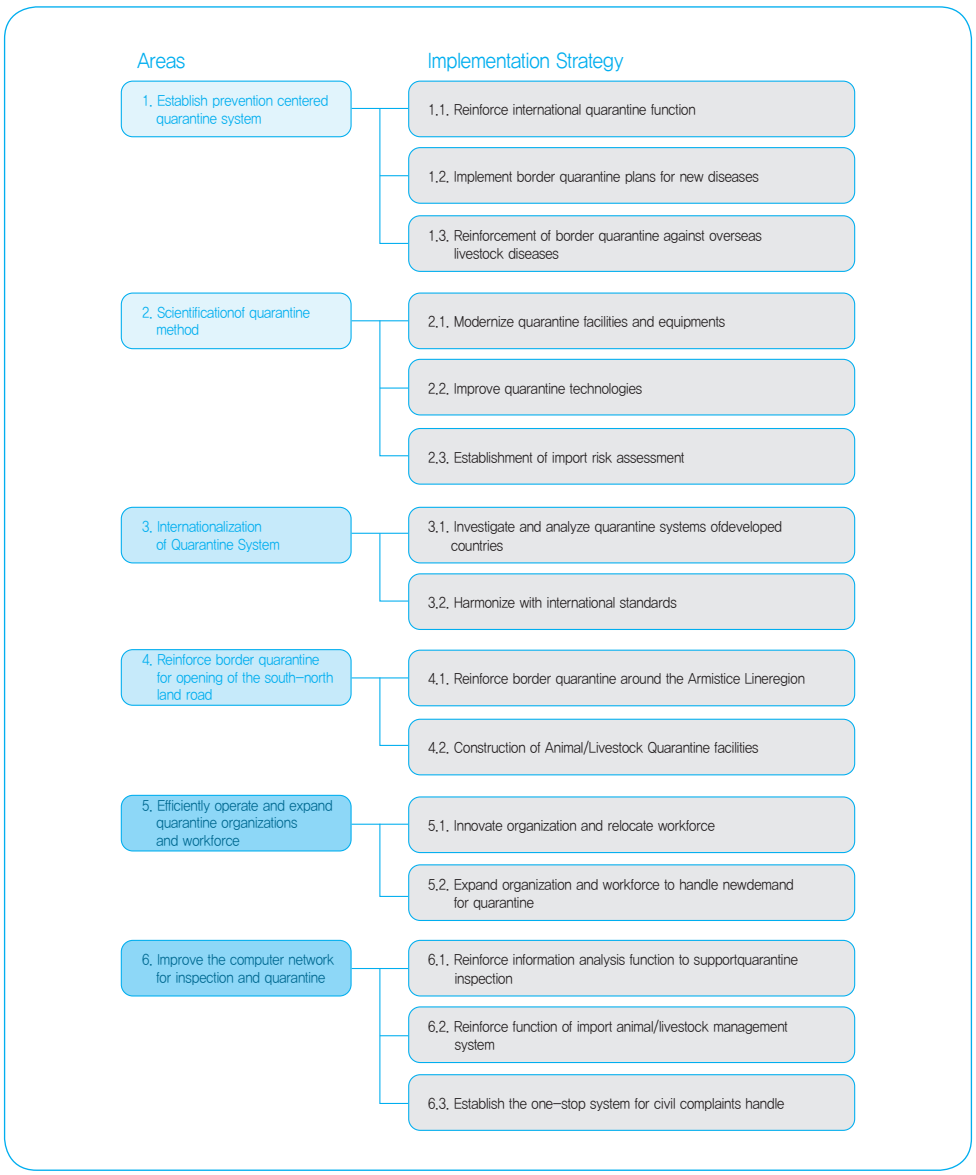
Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

1.2. Goals and Direction of Implementation

The basic goal of the animal and plant quarantine function reinforcement project was to elevate the level of animal quarantine to that of developed countries. The level of precision inspection of microorganisms and contagious disease diagnosis at the time of completion of Phase 2 in 1998 was approximately 60~70% of that of Japan. Accordingly, the government set the goal of achieving 100% workforce, facilities and equipments by the year 2000, and 80% expertise and technological advancement by the same year. In addition, the main direction

for the reinforcement policy included 1) improvement of quarantine regulations and systems, 2) modernization and expansion of quarantine facilities, 3) reinforcement of quarantine workforce expertise, 4) information of animal quarantine and 5) reinforcement of cooperation with outside organizations. Key implementation strategies are shown in the figure below.

Figure 3-1 | Implementation Strategies for Key Areas



Source: Korea Rural Economic Institute, Change of circumstance surrounding animal and plant quarantine and counter plan (1993).

2. Implementation System for Strategy Fulfillment

As for the implementation system, the Ministry of Agriculture, Forestry and Fishery under took the establishment of the Five-year Plan for New Agricultural Administration, enactment of relevant laws and external cooperation with related departments. The National Animal Quarantine Station and the National Plant Quarantine Station took over specific implementation of each project areas, including organization and organization reinforcement, facilities and equipments expansion, securing and training of expert personnel and computerization.

Chapter 4

Specific Implementation of Project Tasks

1. Adoption & Revision of Quarantine Systems (Conformation to International Standards)
2. Reinforcement of Quarantine Organizations, Personnel, Facilities and Equipments
3. Domestic/Overseas Training Aimed at Fostering Quarantine Experts
4. Construction of Quarantine Computerization and Information System
5. Scientification of Quarantine Methods through Adoption of Import Risk Assessment System, etc.
6. Enhancement of Quarantine Efficiency through Adoption of Quarantine Detection Dogs, etc.
7. International Cooperation

Specific Implementation of Project Tasks

1. Adoption & Revision of Quarantine Systems (Conformation to International Standards)

1.1. Animal Quarantine

The first animal quarantine began with the "Act on Quarantine for Exported Cattle", announced in 1909 during Japanese colonization. The law was revised into the "Act on Cattle Disease Prevention in Joseon", which became the basis for the law "Livestock Disease Prevention Act" that was enacted in 1961.

As for the lower-level regulations, the Standard for Quarantine Station Designation for Exported Goods was enacted in 1963 (announced by the Ministry of Agriculture and Forestry), followed by the Regulations on Management Standards and Specifications, and Designation of Storage Managers (Animal Quarantine Rules) in 1964 and the Notification of Regions and Items Restricted for Import of Animals and Livestock Products (announced by the Ministry of Agriculture, Forestry and Fisheries) in 1968. The systematic quarantine system was established with the enactment of the "Quarantine Methods and Standards for Exported/Imported Goods Designated for Quarantine" in 1983.

As for the import sanitation conditions, the first quarantine standards established for cattle and cattle products from Australia in 1967 was used as the common import sanitation conditions for artiodactylous animals and relevant products from the Unites States, Canada, Australia, New Zealand, Japan and Taiwan. As the pattern of livestock disease occurrence changed in each country, the countries came to enact and enforce their own import sanitation conditions to establish their own frameworks for import sanitation conditions.

After 1992, when the animal quarantine function reinforcement project was implemented, the relevant laws went through enactments and revisions: of those enactments and revisions, the provisions related to animal quarantine was geared towards handling the expansion of free trade and efforts to harmonize the international standards.

In particular, the Livestock Product Processing Act consolidated livestock food safety management, which used to be shared between the Ministry of Welfare and the Ministry of Agriculture and Forestry, into the Ministry of Agriculture and Forestry with a specialized veterinary unit that covers farm to table. Experts noted issues of redundancy and an unclear quarantine system and advised that a more systematic management system be constructed. This led to the reinforcement of precision inspection and information.

The laws and regulations related with animal quarantine (as of 2013) are shown in <Table 4-1> and <Table 4-2> below.

Table 4-1 | Laws and Administrative Rules on Quarantine of Exported/Imported Animals and Livestock Products

Items		Note
Acts	Act on the Prevention of Contagious Animal Diseases	Ministry of Agriculture and Food
Enforcement Decrees	Enforcement Decrees of Act on the Prevention of Contagious Animal Diseases	Ministry of Agriculture and Food
Enforcement Rules	Enforcement Rules of Act on the Prevention of Contagious Animal Diseases	Ministry of Agriculture and Food
Announcements	Sanitation Conditions for Imported Goods (82)	Ministry of Agriculture and Food
	Regions restricted for import of designated quarantine products	Ministry of Agriculture and Food
	Rules on fees for serum test and quarantine, etc.	Ministry of Agriculture and Food
	Import risk analysis technique for import of designated quarantine products	Ministry of Agriculture and Food
	Criteria and scope of sterilization, pasteurization, processing of designated quarantine objects	Quarantine Agency
	Scope of animal feeds and other designated quarantine objects	Quarantine Agency
	Management of food remaining in ship and aircraft	Quarantine Agency

Items		Note
Announcements	Submission of cargo manifest via electronic documents	Quarantine Agency
	Criteria and method of quarantine on designated quarantine objects	Quarantine Agency
	Penalties imposition and collection for failure to declare carry-on quarantine objects	Quarantine Agency
	Rules on payment and relevant procedures of fees for serum test and quarantine, etc.	Quarantine Agency
	Regulations on quarantine object management standards, specifications and designation of storage manager	Quarantine Agency
	Submission of pre-report for imported animals	Quarantine Agency
Rules	Scope of application and import conditions for designated quarantine objects without regions restricted for import and import sanitation conditions	Quarantine Agency
	Operation of veterinaries responsible for livestock storage stations	Quarantine Agency
	Precision inspection for contagious diseases affecting exported/imported animals and livestock products	Quarantine Agency
	Detailed guidelines on risk analysis for import of designated quarantine products	Quarantine Agency
	Management of overseas export work stations and quarantine facilities	Quarantine Agency
	Regulations on uniform of quarantine officers of the Ministry of Agriculture, Forestry and Fishery	Ministry of Agriculture and Food
Directives	Operation of detection animals	Quarantine Agency
Total	104.	

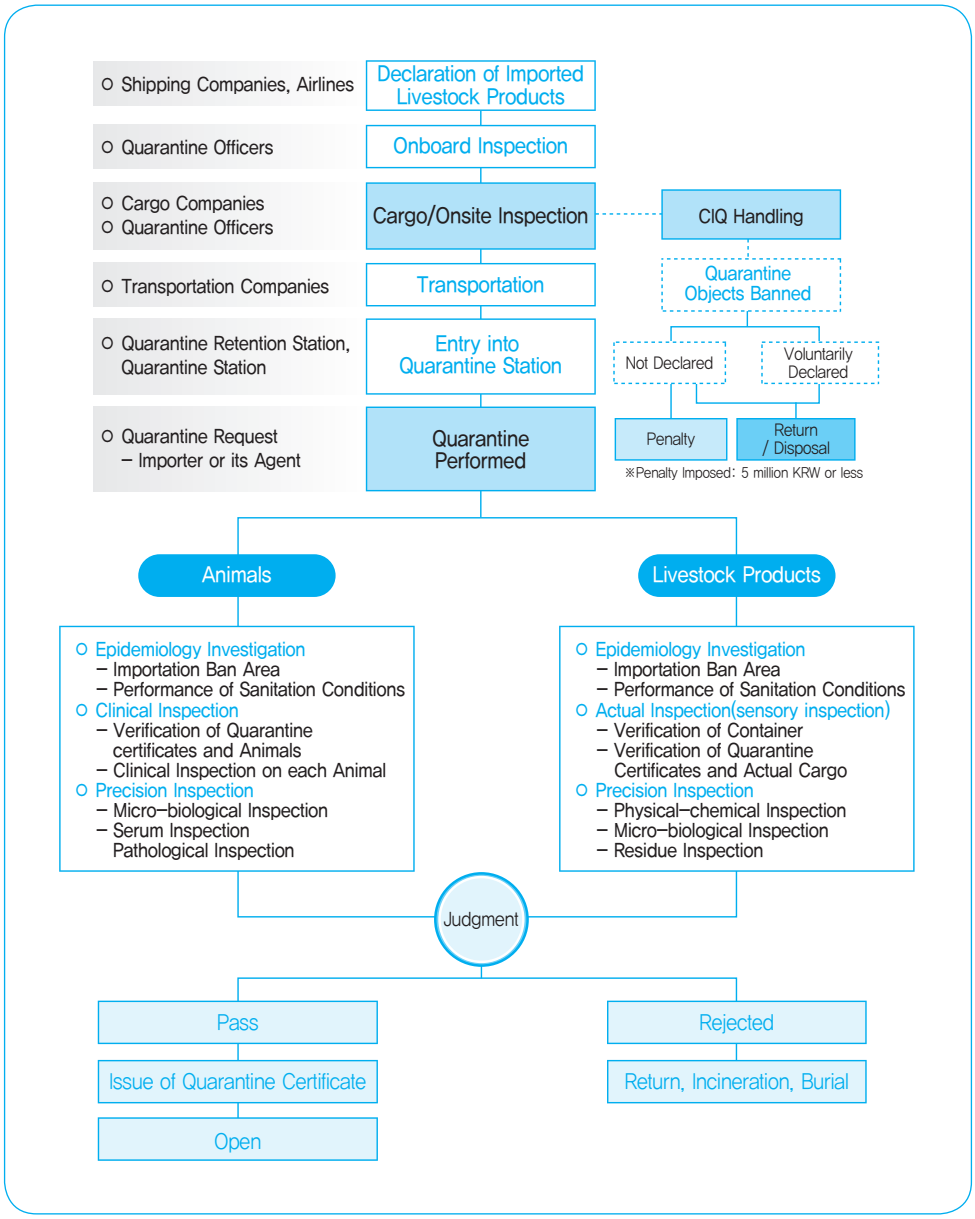
Source: Ministry of Government Legislation (www.moleg.go.kr), Animal and Plant Quarantine Agency (www.qia.go.kr).

Table 4-2 | Laws and Administrative Rules on Hygiene/Safety of Exported /Imported Animals and Livestock Products

Items		Note
Act (1)	Livestock Products Sanitation Control Act	Ministry of Agriculture and Food
Enforcement Decrees	Enforcement Decrees of Livestock Products Sanitation Control Act	Ministry of Agriculture and Food
Enforcement Rules	Enforcement Rules	Ministry of Agriculture and Food
Announcements	Classification of meat part grades and types	Ministry of Agriculture and Food
	Livestock processing standards and ingredient specifications	Quarantine Agency
	Standards for inspection fees and request for livestock products	Quarantine Agency
	Regulations on processing of import declaration for livestock products via exchange of electronic documents	Quarantine Agency
	Standards on indication of livestock products	Quarantine Agency
	Declaration and inspection of imported livestock products	Quarantine Agency
	Standards and procedures for inspection certification by livestock sanitation inspection agencies for imported livestock products	Quarantine Agency
Rules (3)	Standards for rejection after precision inspection for imported livestock products	Quarantine Agency
Directives (2)	Inspection of residues in export pork	Quarantine Agency
	Operation of council for risk assessment for imported livestock products	Quarantine Agency
Total	13	

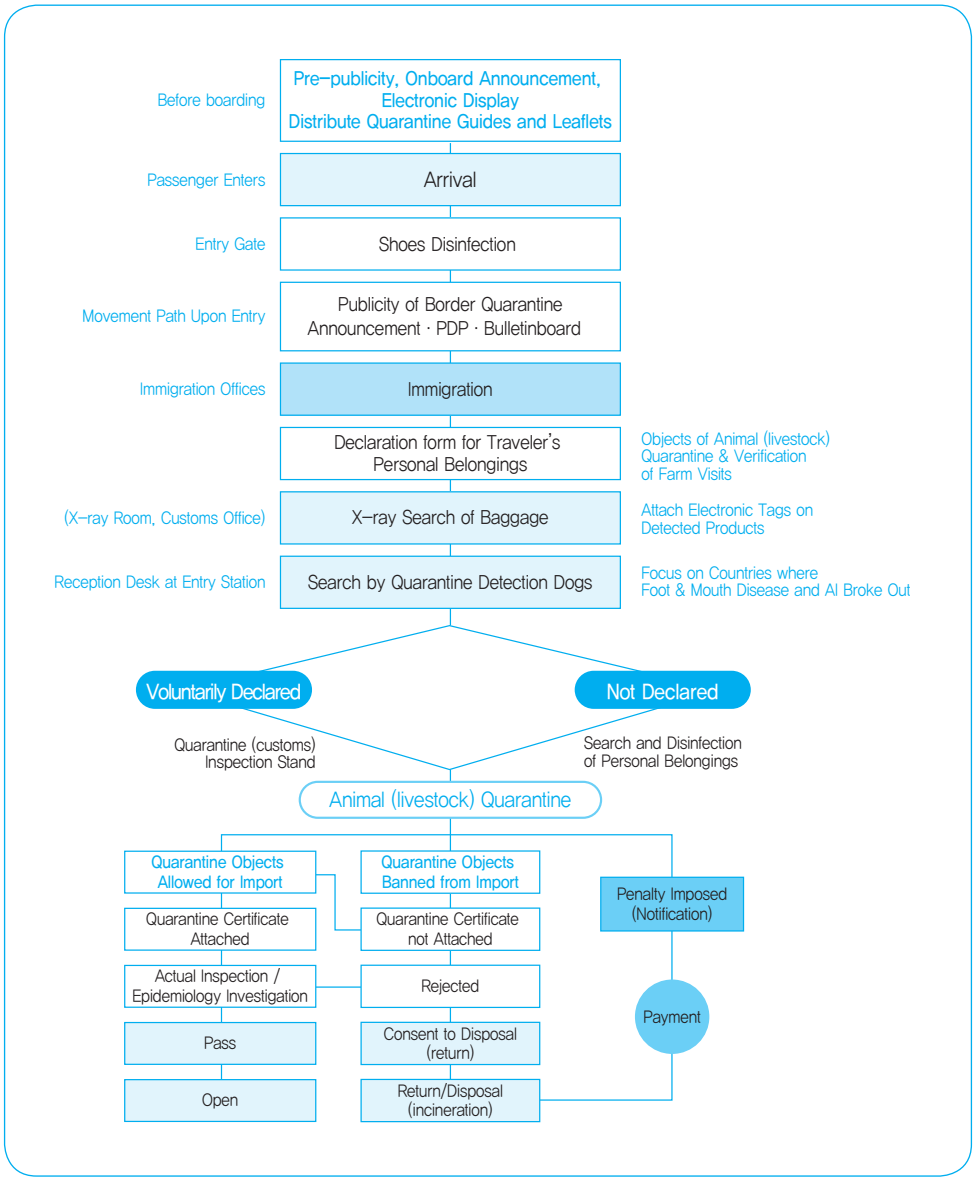
Source: Ministry of Government Legislation (www.moleg.go.kr), Animal and Plant Quarantine Agency (www.qia.go.kr).

Figure 4-1 | Quarantine Procedures for Imported Animals and Livestock Products



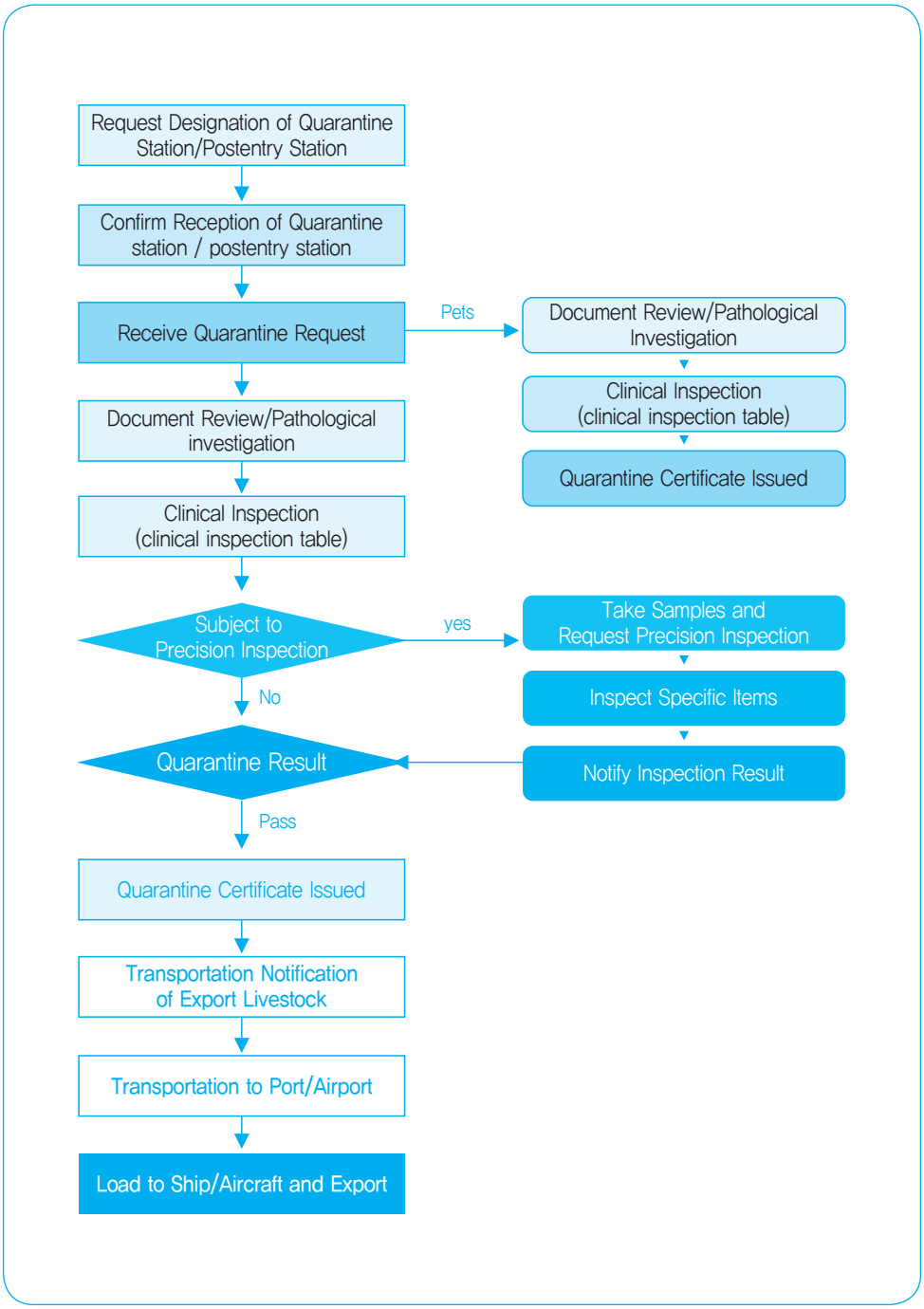
Source: Animal and Plant Quarantine Agency (www.qia.go.kr).

Figure 4-2 | On-site Quarantine Procedures at Ports and Airports (Entry)



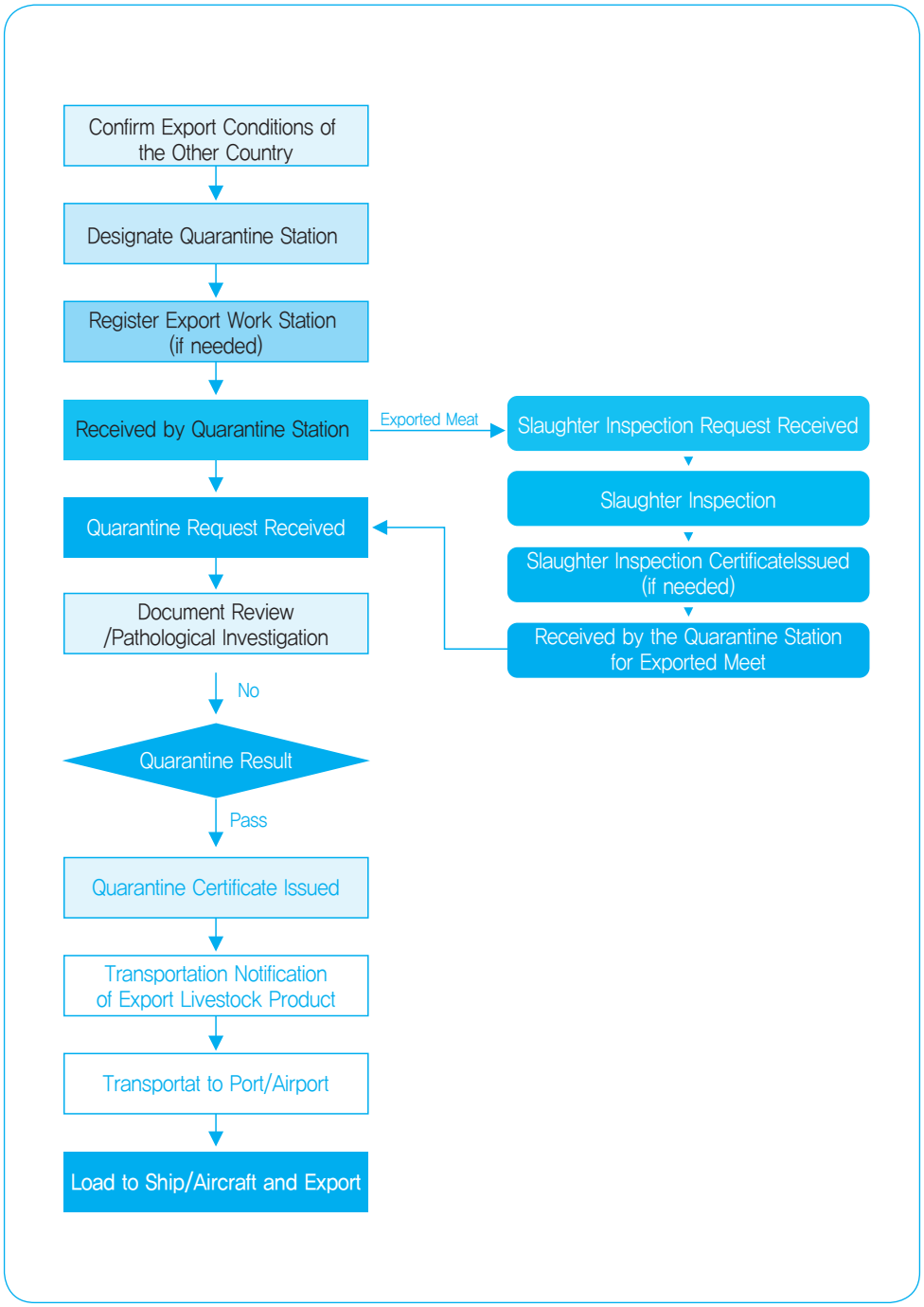
Source: Animal and Plant Quarantine Agency (www.qia.go.kr).

Figure 4-3 | Quarantine Procedure for Exported Animal/Livestock Products



Source: Animal and Plant Quarantine Agency (www.qia.go.kr).

Figure 4-4 | Diagram of Quarantine Procedure for Exported Livestock Products



Source: Animal and Plant Quarantine Agency (www.qia.go.kr).

1.2. Plant Quarantine

1.2.1. Harmonization of Quarantine Systems with International Regulations Including WTO/SPS Agreement

Animal and plant quarantine belongs to the authority of the state, and should be handled in accordance with the international laws based on scientific justification. Animal and plant quarantine went through major changes after the SPS Agreement of the WTO was made in 1995. After the WTO regime began in 1995 the SPS Agreement took effect, which allowed each country to take scientifically justified actions to protect its people, animals and plants, as exception to the GATT.

1.2.2. Harmonization of Plant Quarantine Systems with International Regulations

a. International Plant Protection Convention

The most important international laws related with plant quarantine is the International Plant Protection Convention, or IPPC. IPPC is a convention operated by the Food and Agriculture Organization under the UN, enacted in 1951 and effectuated in 1952. South Korea became a member in 1952. The IPPC is a large-scale international organization with 181 members, established to prevent the inflow and expansion of pests affecting plants. With the effectuation of the SPS Agreement in 1995, the IPPC was recognized as a partner organization for selecting international standards for the plant sanitation field, which stressed the importance of preparation and selection of international standards, and reinforced activities related with international standards.Thirty-six standards have been adopted so far, along with various addenda, schedules and annexes. The IPPC has created and revised 4~5 international standards each year, and the member states are responsible for complying to those adopted standards to the best of their ability.

In line with the above, South Korea is making efforts to monitor the IPPC activities to incorporate international standards into South Korean laws and systems, while attempting to minimize potential conflicts with other countries through revisions and improvements. The IPPC establishes official contact points for official communication. In South Korea, the head of the Export Support Department, Plant Quarantine Division, QIA serves as its

official contact point. Any revisions/enactments related with plant quarantine that could possibly influence trading countries are reported to the IPPC website along with WTO/SPS notifications.

b. Revision of the Plant Protection Act (1995)

After effectuation of the WTO/SPS Agreement, the Plant Protection Act was fully revised as of December 6, 1995. Before the revision, quarantine measures including infection were ordered for all pests. After the revision, on the contrary, only quarantine pests were subject to quarantine measures. The revised act provided for legal grounds for restricting imports of plants from regions where quarantine pests have broken out and could possibly be transmittedto South Korea. Also, the revision adopted pests risk analysis to determine quarantine pests and standards for quarantine measures. When the exporting country wants or there is scientific need, the Act allowed for dispatching a plant quarantine officer to the exporting country. The Act also allowed for importing banned products that were determined as having no risk of harming domestic plants by the risk analysis, on the condition that the exporting country proposes ways to eliminate the pests. The Act also allowed individual cultivation at national facilities, and laid the legal groundwork for exempting plant quarantine officers from liability when proper performance of their works, disinfection and disposals were demonstrated.

c. Designation of Quarantine Diseases/Pests Conforming to International Standards

In order to designate quarantine pests according to international standards, the Task Force for Quarantine Diseases/Pests Designation was formed to investigate quarantine pests and to identify key pests affecting major crops that could potentially be transmitted into South Korea. The Task Force also categorizedeach import item and requested a review of 2,000 types of quarantine pests by academia and research institutes. After the review, 1,500 types were selected as quarantine pests, for which a data sheet was prepared. Apests risk evaluation was performed with the support of the National Institute of Agricultural Science and Technology, which produced 1,379 types of quarantine pests.

Table 4-3 | Current Diseases/Pests Subject to Quarantine

□ General Status of Quarantine Diseases/Pests

(Unit: species)

	Total	Pathogen	Wild Weed	Pest
Total	1,379	341	5	1,033
Banned Pests	39	11	-	28
Controlled Pests	1,340	330	5	1,005

□ Status of Managed Diseases/Pests by Imported Plant

(Unit: species)

Items		Pathogen						Pest					Weed
		Total	Fungus	Bacteria	Phytoplasma	Virus analog	Viroid	Total	Insect	Sand fly	Nematode	Snail	
Total		420 (330)	327 (243)	36 (35)	13 (13)	41 (36)	3 (3)	1,664 (1,005)	1,493 (906)	84 (48)	40 (27)	47 (24)	20 (5)
Replant	○ Sapling												
	-Fruit Tree	129	94	5	10	18	2	389	335	38	15	1	
	-Tree	58	56	1	1	-	-	178	169	4	4	1	
	-Flower	46	32	4	2	7	1	211	184	8	6	13	
	○ Bulb & Tubers												
	-Bulb	36	21	4				16	13	2	1		
	-Potato							26	24		2		
	○ Seed												
	-Grain Seed	55	40	13		2		14	14				5
	-Vegetable Seed	23	16	4		3		-	-				5
	-Tree/grass Seed	17	14	3				6	5		1		5
	-Others	11	9	2				8	8				5
Non-replant	○ Cut Flower/Branch							75	73	3		9	
	○ Grain & Herb							32	32				
	○ Fruit	35	35					162	144	17		1	
	○ Vegetable												
	-Vegetable	10	10					176	144	5	5	22	
	-Fruit Vegetables							92	85	7			
	○ Woodand Bamboo							174	174				
	○ Others							105	99		6		

※ ( ) No. of designated quarantine items.

Source: National Plant Quarantine Agency, Plant Quarantine Yearbook (1980~2011).

Experts from various fields were invited to a consultation meeting for designating pests/diseases subject to quarantine in November 1996, followed by the announcement of pests subject to management for each type of imported plants. Pests risk assessment has been performed once a year to add or remove management pests and notify the SPS and IPPC of the list.

The analysis system was first adopted in 1993 for pests first discovered in South Korea. The regulation, however, only vaguely provided for biological, economic, quarantine and social analysis due to a lack of international standards. The SPS Agreement and the revised IPPC came to include pests risk analysis, and the IPPC adopted relevant international standards. The Plant Protection Act adopted in 1995 used the term 'pests risk analysis' for the first time, and the Enforcement Decree specified the details of the analysis. The Enforcement Rule divided the risk analysis process into three stages: verification, risk assessment and risk management. The detailed instructions on risk analysis were announced in 1996, which divided the risk analysis procedure for importation banned plants into eight stages.

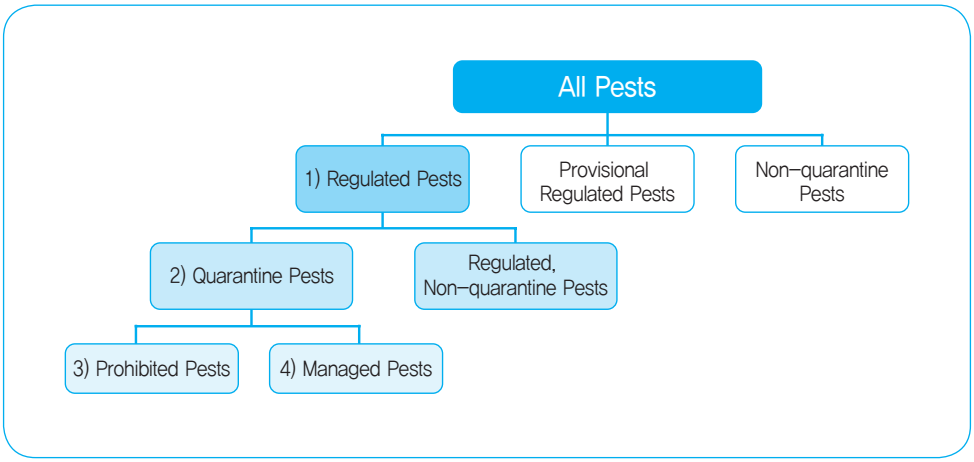
d. Enactment/Revision of Lower-level Regulations after Establishment of International Standards

After the revision of the Plant Protection Act, the Enforcement Decree of the Act was enacted on December 5, 1996. The Decree laid down the requirements for permission of importation of banned products for research purposes, and specified the cases where pests risk analysis should be performed.

Adoption of plant sanitation standards by the IPPC led to a series of revisions of the relevant laws and regulations: the second revision of the Plant Protection Act renewed the list of pests subject to quarantine, and introduced a penalty provision for failure to declare carry-on plants. The second revision of the Enforcement Decree of the Plant Protection Act on November 1, 2002 set the legal groundwork for the pests risk analysis.

The Enforcement Rule of the Plant Protection Act was first enacted in 1963, and it specified the importation ban areas and plants, as well as ports permitted for plant importation. The Enforcement Rule went through repeated revisions due to the outcome of pests risk analyses, expansion of international ports and adoption of the IPPC standards. In particular, as for banned pests that were potentially dangerous if transmitted into South Korea, the types, regions and relevant host plants expanded or were reduced in accordance with the relevant information. After revision of the Plant Protection Act, the Enforcement Rule was also revised on December 7, 1996. This revision clarified the concept of banned pests and management pests, and expanded the quarantine scope to include wild weeds.

Figure 4-5 | Pests Diagram under the Plant Protection Act



Source: Animal and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

The revised Enforcement Rule also specified qualifications and recruitment of plant protection officers, and laid down the procedures for importation of banned products for research purposes. The risk analysis procedure was divided into verification, assessment and management stages. Criteria for administrative disposition, including disinfection, disposal and return for quarantine pests, were clarified in 1998. The revision also allowed for treating pests as quarantine pests even before quarantine pests designation, and included processing as one of the disposition methods. The importation ban areas, plants and pests were also revised. For example, the entire world was designated as a banned area for fruits, fruit vegetables and young soybeans.

The deadline for disposal and return was set to 20 days after the date of the disposition order. In 2001, to support the hosting of an international exhibition, the Rule allowed for import declaration and inspection requests for plants and banned products imported for international conferences to be recognized by the government at the exhibition site. In 2002, the Rule provided the basis for a simplified risk assessment, allowed for a separate disposition for each inspected unit, and the crushing and heat treatment of wild weeds. Regulations on disinfection/waste cost and penalty collection were also introduced.

After the revision of the Plant Protection Act in 2004 the inspection of plants imported or going through ground rods was made possible. The Enforcement Rule was also revised to include railway stations and customs stations as plant quarantine stations. In addition,

legal grounds for import permission was stipulated by the Rule, which also provided for procedures and methods related to inspection for pass-through, report of safety issues, and arrival report/inspection.

In 2006, the Rule was revised to allow for disposal and return of only selected plants and banned products if banned products are partially included in the object and satisfy the criteria set and announced by the head of the plant quarantine station. The cabbage and pepper foilar and thistle foilar were removed from the banned plants list, and the host plant for oak tree disease and the relevant areas were added to the importation and plants and areas list.

In 1993, twenty-four rules and announcements on imported plant quarantine were consolidated into the Instructions for Imported Plant Quarantine (announced). The Instructions included: scope of imported plants subject to inspection, criteria for importation banned plants and plants exempted from inspection, quantity and methods subject to inspection, specification of countries required to attach plant inspection certificates, definition of plants with high occurrence of pests subject to local disinfection at the exporting country, details on designation and management of imported plant quarantine sites, details on plant quarantine for aircraft and storages, post-management and waste management from importation banned products, use of plant quarantine certificates and overtime works and importation banned areas.

The Instructions have been revised almost every year due to revisions of higher-level laws, diversification of plant quarantine and enactment/revision of international standards. Issuance of an inspection certificate to importers was omitted in case of notification through EDI of the Korea Customs Service in 1997, and sawdust was removed from the banned list.

The scope of frozen plants exempted from an inspection certificate changed to plants maintained at -17.8°C or below at the time of import inspection, attached with the inspection certificate.

In 2002, pellets, cubes, films, powder and tea, mixed grains simply processed through heat, dryness, crushing and pressurization were exempted from inspection certificate attachment. The conditions for recognition were established for cases where actually imported quantity and the quantity indicated on the inspection certificate did not match,

and the revised regulations provided that underground parts of walnut fruits, potatoes, egg plants foilars and fruits, and fruits from Oskan tree berry should be considered as banned plants despite the freezing treatment.

Fruits within frozen tree berries were changed to domestic frozen fruits from countries other than EU members and New Zealand. An international standard to prevent the inflow of pests through wooden packaging materials was adopted by the IPPC in 2002. In response, South Korea initiated quarantine on wooden packaging materials by enacting the 'Quarantine Instructions on Wooden Packaging Materials of Imported Cargo' on December 23, 2003.

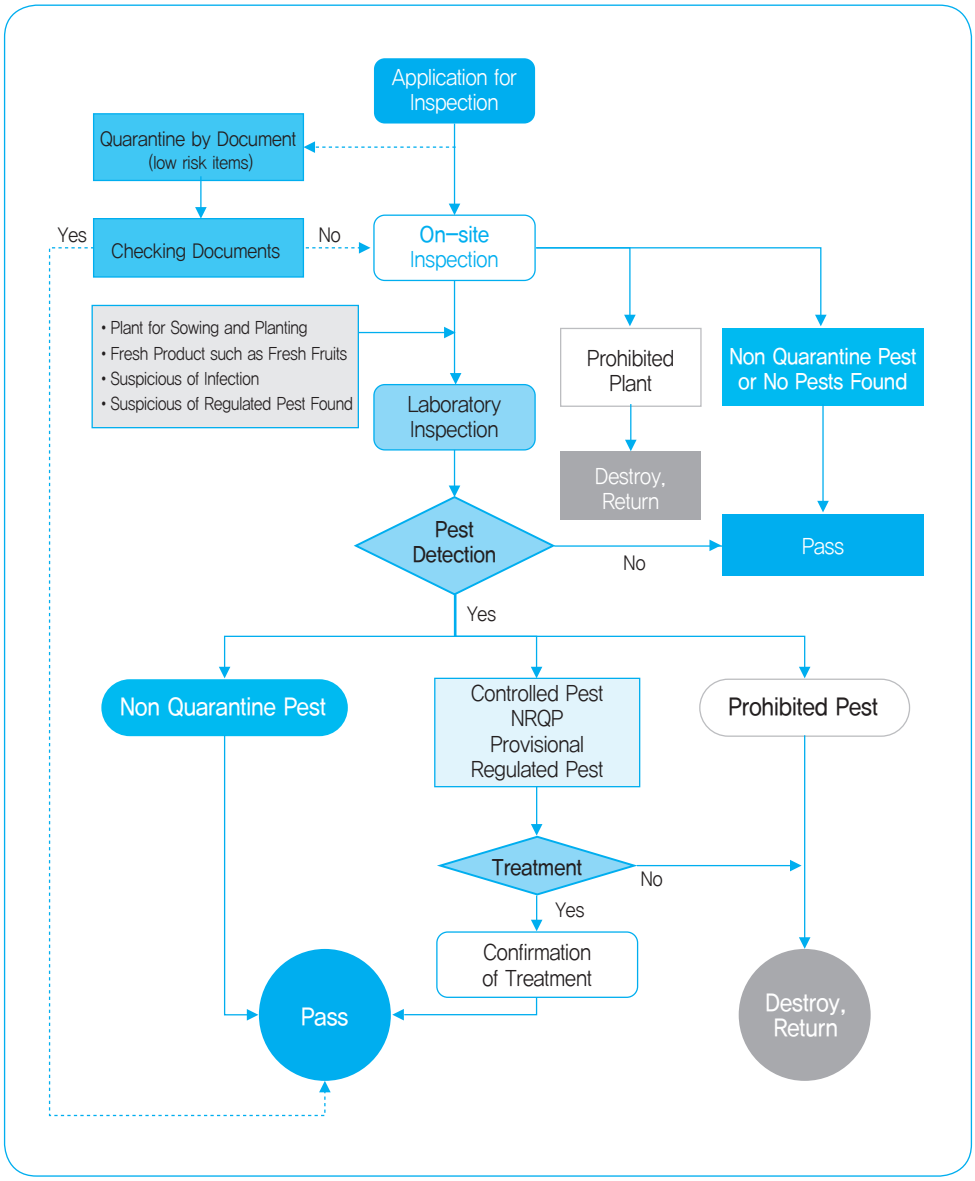
However, as the quarantine was expanded to cover wooden packaging materials of all cargos, including plant quarantine objects, its implementation was deferred to May 31, 2005, and its implementation actually began on June 1st of the same year. The Instructions were revised in 2005 and 2006, to account for changes caused by the revisions of the international standards. When the Bio Safety Protocol was adopted in 2002 and took effect in 2003, Domestic Laws for LMO safety management was enacted in 2001 under the supervision of the Ministry of Knowledge and Economy. It was followed by the enactment of its enforcement decree (2005), enforcement rule (2006) and integrated notifications (2007). The QIA was selected as the border quarantine organization for agricultural LMO's, tasked with monitoring the carriage of unauthorized LMO's and non-compliance with indication requirements.

Table 4-4 | Laws on Exported/Imported Plant Quarantine

Plant Quarantine	
Act (1)	Plant Protection Act
Announcements (81)	Instructions for Import Plant Quarantine
	Instructions for Export Plant Quarantine
	Standards for Import Plant Quarantine Certificate
	Instructions for Individual Cultivation
	Regulations on Quarantine Disinfection for Exported/Imported Plants
	Methods of Documentation, On-site Quarantine and Laboratory Precision Quarantine for Each Plant
	Instructions on Quarantine on Wooden Packaging Materials for Exported/Imported Cargo
	Exemption of Fresh Mango from Thailand from the Import Ban Plants List
	Exemption of Fresh Orange from Spain from the Import Ban Plants List
	Exemption of Fresh Dragon fruit from Vietnam from the Import Ban Plants List
	Instructions for Export Quarantine on Korean Shepherd's Purse with Root
	Instructions for Export Quarantine on Korean Fresh Grape Exported to Australia
	Instructions for Quarantine on Korean Bonsais Exported to EU
Rules (15)	Work Instructions for Special Judicial Police Officers for Plant Protection
	Instructions for Quarantine Site Safety Management
	Specific Instructions on Processing of Imported Plant Quarantine
	Instructions on Designation and Operation of Plant Quarantine Officers at Quarantine Sites for Plants for Re-planting
	Instructions on Monitoring Investigation for Diseases/Pests Affecting Plants
Directives (1)	Instructions on Operation of Epidemiological Investigation for Diseases/Pests Affecting Plants
Total	13

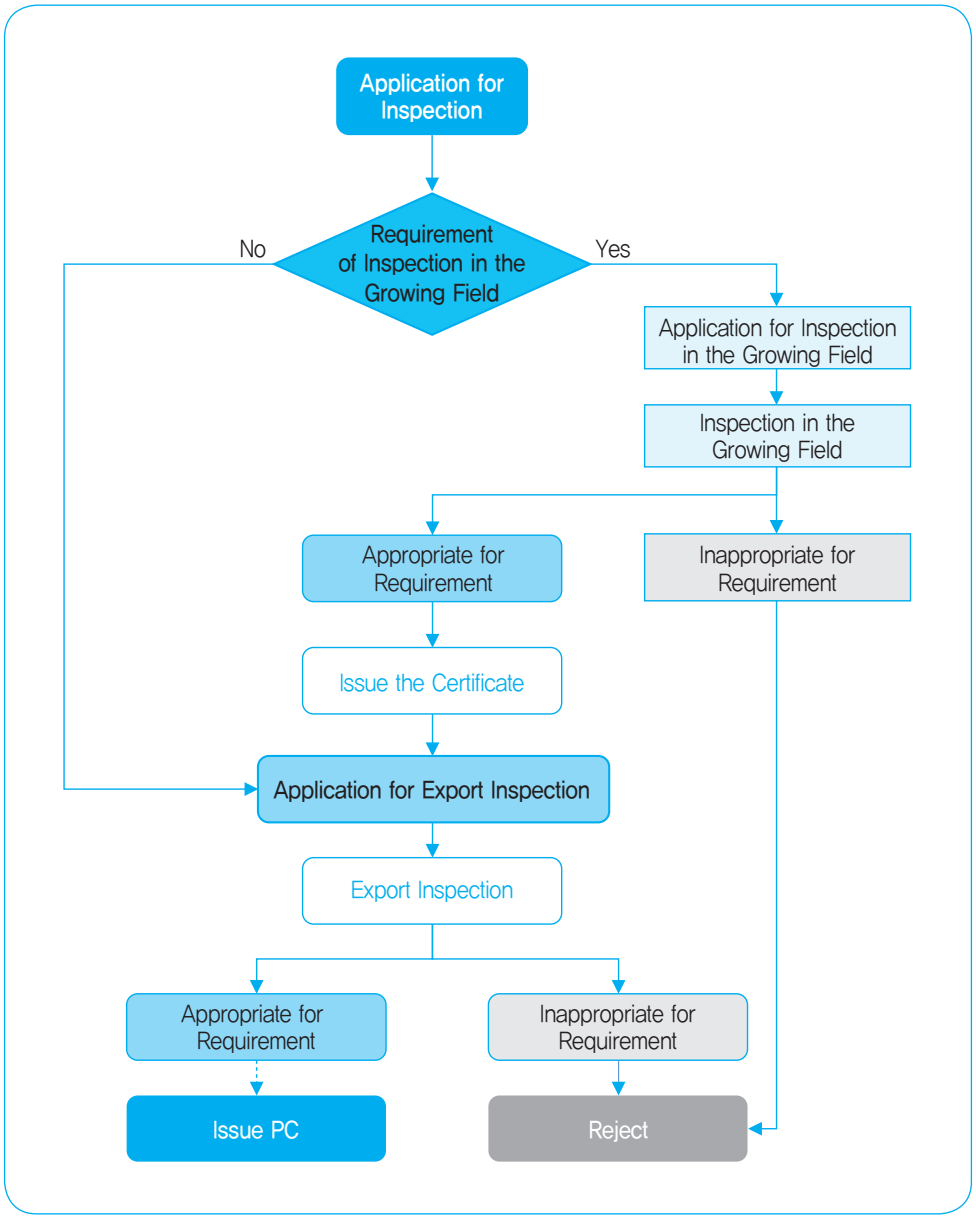
Source: Animal and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

Figure 4-6 | Quarantine System for Import Plant



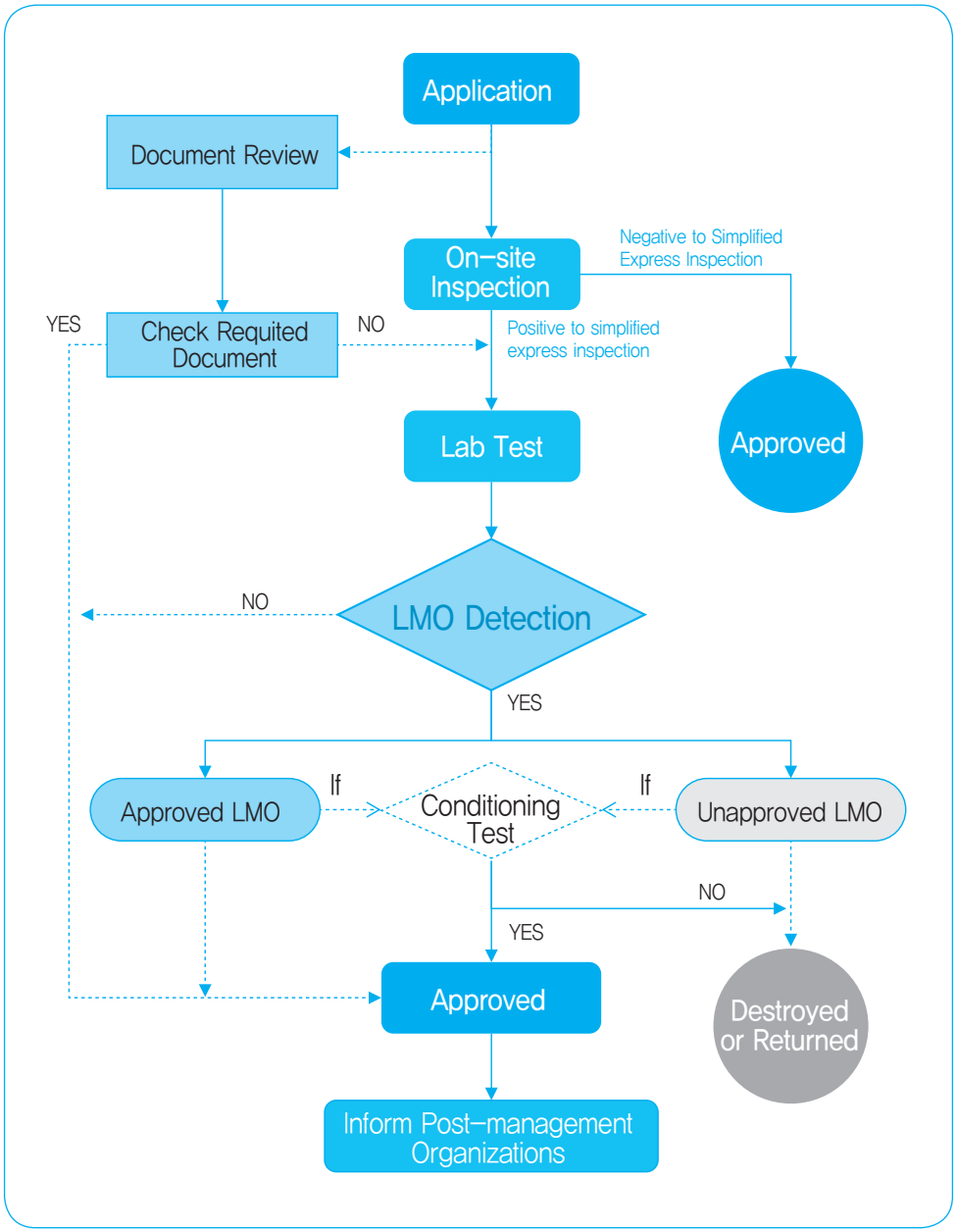
Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

Figure 4-7 | Quarantine System for Exported Plants



Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

Figure 4-8 | Inspection System for Agricultural Genetically Modified Organism



Source: Animal and Plant Quarantine Agency Web., Examination of Agriculture LMO.

2. Reinforcement of Quarantine Organizations, Personnel, Facilities and Equipments

2.1. Animal Quarantine

2.1.1. Overview and Outcome of Project Phases

a. Phase 1 ('92~'95)

Phase 1 of the Animal Quarantine Function Reinforcement Project was implemented as part of the Five-year Plan for New Agricultural Administration by the Ministry of Agriculture, Forestry and Fishery, in response to the expansion of free trade of agricultural products. The original plan covered five years from 1992 to 1996. However, the project period was reduced by one year to more effectively adjust to the changes in the global environment, including the WTO and was linked to Phase 2 after revising its goals.

Phase 1 focused on reinforcement of both hardware and software that had been lacking. First, as for organization and workforce, reinforcement focused on securing an expert workforce and personnel specializing in precision inspection at laboratories and international tasks. In terms of facilities, Phase 1 focused on retention stations and laboratories for precision inspection. The existing quarantine stations were repaired and improved, along with the construction of facilities for pets, seed pigs and deer, which were insufficient. As for equipments, expensive precision equipments were the main goals, including high-performance liquid chromatography and gas chromatography devices for precision inspection of antibiotics, synthesized antimicrobial and hazardous residues. Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

b. Phase 2 ('96~'97)

Phase 2 of the Project was implemented when the WTO regime began to accelerate the proliferation of free trade in 1995, and the WTO SPS Agreement went into effect, rising as the core of conflicts surrounding animal and plant quarantine. Phase 1 was recognized for reinforcing the overall quarantine infrastructure, but criticized for being inadequate in handlingthe expansion of free trade, settlement of international regulations and increased workload related with exported/imported animals and livestock products. Therefore, a new plan was introduced to supplement the shortcomings. The project period of Phase 2 was also reduced by one year in response to free trade of imported agricultural/fishery products (except for rice) in 2001, and thus implemented as a two-year project rather than the original three-year. Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

c. Phase 3 ('98~'00)

Phase 3 was implemented after cutting short Phase 2 by one year, in response to free trade of imported agricultural/fishery products (except for rice) in 2001. Quarantine capabilities of South Korea were diagnosed to be 60~70% of that of Japan after implementation of Phases 1 and 2. However, an increased number of quarantine cases and diversification of quarantine demands warranted the need for securing additional technical experts and scientification of the system's operation. Therefore, the government chose and implemented key tasks such as the reinforcement of domestic/overseas training, improvement of collection/analysis of international information and reinforcement of quarantine facilities at newly built airports and ports. While Phases 1~2 focused on hardware reinforcement, Phase 3 geared towards software reinforcement. Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

d. Phase 4 ('01~'04)

Phase 4 was designed against the background that the level of quarantine in South Korea caught up with that of Japan through the three phases implemented for nine years after 1992, and new changes in the quarantine work environment was incorporated into the plan. New international issues related with animals and livestock products quarantine at the time included: outbreak of mad cow disease in the US and other regions, proliferation of foot & mouth disease in South Korea and Japan in 2000, as well as an outbreak of new zoonoses such as West Nile Fever and Ebola. In addition, the people's demand for livestock products quarantine also increased as more people were interested in the safety of imported livestock products, due to an increase of new quarantine demands after the revitalization of ground tradeand a rapid increase of beef. Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

e. Phase 5 ('05~'08)

Phase 5 focused on incorporating changes in the environment and supplementing shortcomings. In 2000 and 2002, as a supplementary measure for foot & mouth disease, a project aimed at the collection of international information, reinforcement of risk analysis system, and traveller management reinforcement were implemented to prevent their transmission. Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

f. Phase 6 ('09~'12)

Phase 6 was implemented along the lines of Phase 5. At the time, a new system needed to be built to account for new environment challenges under the Doha Development Agenda (DDA) and agriculture negotiations for free trade agreements (FTA). Outcome and evaluation of Phase 6 implementation are shown in <Table 4-5> below.

Table 4-5 | Summarized Results of Each Animal Quarantine Reinforcement Stage

Phases	Outcomes	Evaluation
Phase 1 '92~'95	· Precision Inspection Laboratory, Special Quarantine Facilities · Securedequipments for contagious diseases/sanitation inspection · Animal quarantine computer network · Enactment and revision of laws and sanitation conditions	· Training of quarantine experts and procurement of advanced equipments · Expansion of precision inspection items · Enactment/revision of quarantine regulations and import sanitation conditions · Lack of infrastructure, including expert workforce
Phase 2 '96~'97	· Precision inspection laboratories, quarantine stations · Expansion of systems including automated sample processing systems · Construction of KAQIS between the main station and branch stations · Construction of AIIS	· Procured hardware matching the level achieved by Japan through expansion of state-of-the-art facilities and equipments · The expansion is not adequate for handling variouschanges such as increase of quarantine cases and diversification of quarantine demands.
Phase 3 '98~'00	· 98.8.1, Inauguration of National Institute for Veterinary Science and Quarantine (Integrated constitutions) · Secured quarantine sites and facilities in Incheon International Airport · Secured precision laboratories and special quarantine facilities · Secured additional systems including radiation meters	· Extensive reinforcement to achieve technological approval for quarantine inspection,information of quarantine inspection and import analysis on quarantine information. · Lack of experts for new diseases/ substances · Lack of advanced quarantine equipments andreplacement of deteriorated equipments
Phase 4 '01~'04	· Construction of Yeongjongdo Quarantine Station and modernization of quarantine facilities · Construction of sealed laboratories ('01) · Modernization of quarantine equipments · Operation of Sanitation Conditions for Imported Goods · Laboratory Information Management System (LIMS) · Quarantine detection dog system adopted	· Aid the groundwork for quarantine systemadvancement · Lack of organizations and workforce reinforcement to accommodate increased quarantine workload

Phases	Outcomes	Evaluation
Phase 5 '05~'08	· Set up the Import Risk Analysis Department ('06) · Establishment of the overseas quarantine information system ('07) · Simplified notification system for rejected quarantine objects sent via mail ('08) · Expansion of the quarantine detection dogs system	· Successful implementation and expansion of detection dogs system
Phase 6 '09~'12	· Expansion of quarantine facilities (quarantine stations) · Modernization of quarantine equipments · Expansion of import sanitation conditions · Adoption of management system for livestock-related personnel traveling overseas ('11)	· Reinforced border quarantine through adoption of the livestock-related persons management system · Continuous changes of surrounding circumstances, including outbreak of livestock diseases in neighboring countries

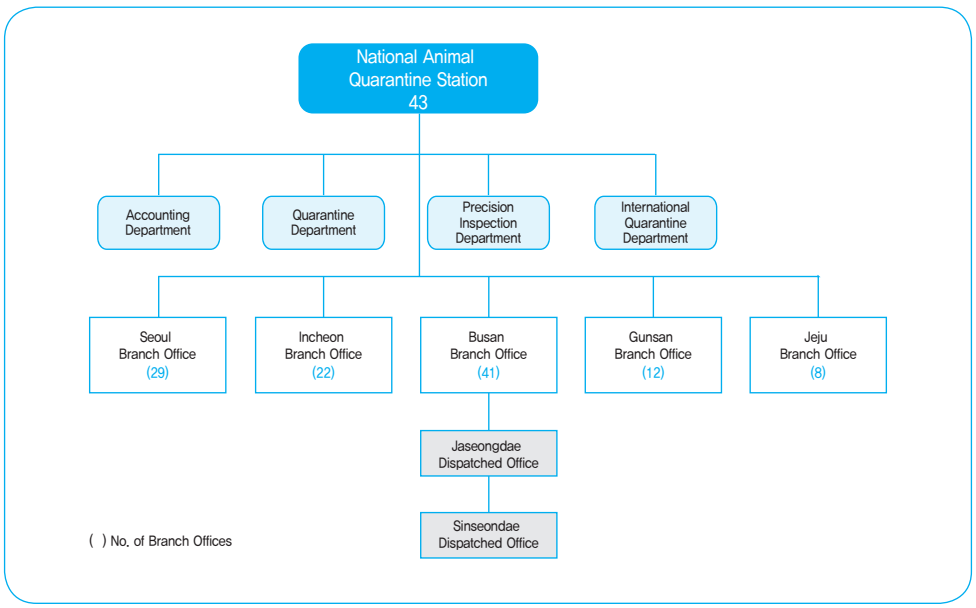
Source: National Veterinary Research & Quarantine Service, Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

2.1.2. Changes of Animal Quarantine Organization and Workforce

a. Organization

The number of personnel at the National Animal Quarantine Station was 169 in 1992, the year when the Reinforcement Project was first implemented. The organization consisted of four main offices (57 personnel), five branch offices (112) (including two dispatched offices), of which 102 were animal quarantine officers (veterinary series). After integration with the Veterinary Science Research Institute into the National Institute for Veterinary Science and Quarantine in 1998, the organization consisted of two divisions, thirteen departments, five branches and nine dispatched offices with 437 personnel, of which 224 were animal quarantine officers (veterinary series). The Institute was later reorganized into the Agricultural and Fishery Quarantine & Inspection Agency consisting of five divisions, twenty-nine departments, six quarantine/inspection offices and thirty offices, with 1339 personnel of which 369 were animal quarantine officers (veterinary series).

Figure 4-9 | Organization and Institutions of National Animal Quarantine Office in 1992



Source: National Animal Quarantine Service, annual report 1992.

Table 4-6 | Organization and Personnel Changes for Each Stage of Animal Quarantine Reinforcement Project

Items		Organizational Change	Personnel Change (veterinary)	Note
Phase 1	'92	4 departments, 5 branch offices and 2 dispatched offices	169 (102)	National Animal Quarantine Station
	'95	5 departments, 5 branch offices and 8 dispatched offices	203 (124)	National Animal Quarantine Station
Phase 2	'96	5 departments, 5 branch offices and 8 dispatched offices	241 (156)	National Animal Quarantine Station
	'97	5 departments, 5 branch offices and 8 dispatched offices	272 (190)	National Animal Quarantine Station

Items		Organizational Change	Personnel Change (veterinary)	Note
Phase 3	'98	2 divisions, 13 departments, 5 branches, 9 dispatched offices	437 (224)	National Institute for Veterinary Science and Quarantine
	'00	2 divisions, 14 departments, 5 branches, 9 dispatched offices	449 (227)	National Institute for Veterinary Science and Quarantine
Phase 4	'01	3 divisions, 16 departments, 5 branches, 12 dispatched offices	480 (244)	National Institute for Veterinary Science and Quarantine
	'04	3 divisions, 15 departments, 5 branches, 14 dispatched offices	518 (264)	National Institute for Veterinary Science and Quarantine
Phase 5	'05	3 divisions, 15 departments, 5 branches, 14 dispatched offices	519 (265)	National Institute for Veterinary Science and Quarantine
	'08	2 divisions, 1 institute, 19 departments, 6 branches, 12 offices	585 (310)	National Institute for Veterinary Science and Quarantine
Phase 6	'09	3 divisions, 19 departments, 6 branches, 12 offices	591 (334)	National Institute for Veterinary Science and Quarantine
	'12	5 divisions, 29 departments, 6 quarantine inspection stations, 30 offices	1,339 (369)	Agricultural and Fishery Quarantine & Inspection Agency

Source: National Veterinary Research & Quarantine Service, Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

2.1.3. Quarantine Facilities Equipments Reinforcement Changes

In 1992, when the mid/long-term plan was established, the quarantine infrastructures-organization, workforce, facilities and equipments-were not capable of handling the increased quarantine demand after the market opened up. This was caused by a lack of scientification, slowness and a weak objective basis for quarantine procedures, as well as the inability to counteract conflicts with or objections from trading countries regarding quarantine and quarantine results. In order to overcome those issues and secure the workforce, facilities and equipments and expertise to account for increased trade, the South Korean government invested in what is now a developed country-level of facilities and equipments.

a. Quarantine Facilities

The total area of animal quarantine facilities in 1992 included 8,000 m^2 for quarantine warehouses and 13,000 m^2 for quarantine stalls. In order to secure the capability to handle the increased demand for quarantine on imported animals/livestock products and inflow of overseas contagious diseases and prevent hazards caused by overseas livestock products, facilities expansion began starting from quarantine stations, autopsy/pathological test rooms, experiment animal stalls, and large incineration stations. After construction of the Yeongjongdo Quarantine Station ('01) and laboratories at the Seoul Regional Agency and the Yeongnam Regional Agency, expansion of animal quarantine stations and modernization/ repairs of existing facilities resulted in animal quarantine facilities with a total area of 167,000 m^2.

- Area of quarantine facilities (thousand m^2) ('92) 22 → ('12) 167 [659% ↑ from 1992]

b. Quarantine Inspection Equipments

Laboratory equipments were secured as per the scientification strategy for quarantine methods, for the purposes of securing precision inspection capabilities. Fifty-eight state-of-the-art equipments were acquired, followed by continued acquisition of additional equipments, replacement of deteriorated equipments, and adoption of advanced inspection equipments after improving inspection methods. As a result, the number of equipments increased from 695 in 1992 to 3,700 in 2012.

- Number of precision inspection equipments retained (unit: equipments) ('92) 696 → ('12) 3,700 [432% ↑ from 1992]

c. Precision Inspection Capabilities

The above equipment expansion resulted in increased precision inspection capabilities.

Including the capability to diagnose and test livestock contagious diseases, South Korea has enhanced its inspection capabilities on pathogenic microorganisms, pesticide residues, heavy metals and radiation to handle the qualitative increase of import quarantine volume, and reviews safety of imported livestock products during the import stage to protect the people's health. South Korea was able tosecure objectivity and accuracy of inspection results, thereby resolving conflicts with trading countries over inspection capabilities and securing safeimported livestock products.

Compared with 1992, when the mid/long-term plan was established, the inspection capabilities for livestock contagious diseases rose by 89%, those for residue substances rose by 257%, and the inspection capabilities for microorganisms increased after its initial adoption.

In addition, in order to account for changes in the inspection environment caused by new diseases and development of new inspection methods, maintenance training sessions are being performed on a regular basis.

- Precision inspection capabilities for livestock contagious diseases ('92) 23 diseases → ('12) 41 diseases [89% ↑]
- Residue inspection ('92) 23 diseases → ('12) 204 diseases [257% ↑]
- Food microorganism inspection ('92) → ('12) 17 diseases

2.1.4. Animal Quarantine Facilities

There arethree quarantine facilities for animals imported from overseas: Yeongjongdo Quarantine Station, Busan-Yeongnam Quarantine Station, and Jeju Yonggang Quarantine Station.

a. Yeongjongdo Quarantine Station

Yeongjongdo Quarantine Station began its operation in September 2001, along with the opening of Incheon Airport. It is run by the Special Quarantine Department of Incheon Airport Regional Agency. With a site area of 167,845m², building area of 24,575.68m², the Station consists of a cattle shed, breeding cattle shed, pig shed, horse shed, and a total number of 44 buildings. The Station has freezing/low-temperature facilities capable of storing imported animals and livestock products.

Table 4-7 | Overview of Facilities at Yeongjongdo Quarantine Station

Items	Description
Location	933-1 Unbuk-dong, Jung-gu, Incheon
Site Area	167,845m² (including shared area of 33,037m² and the Detection Dogs Center)
Building Area	24,575.68m² (7,434.14 pyeong)
Total Area	25,622.21m² (7,750.72 pyeong)
Building Coverage /Floor Area Ratio	18.23%/19.01%
Main Purpose	Animal/Plant Facilities (Animal Quarantine Station)
Operation Initiated on	December 6, 2001
Main Facilities	Quarantine Station, Animal Sheds, Freezer/Low-temperature Storage, etc.

Source: A study on procurement of alternative site for bulrodong quarantine station (2013).

Table 4-8 | Size and Scale of Yeongjongdo Quarantine Station

Purpose of Facility	Quantity	Size (m²)	Scale	Note
Cattle	9	9,066.39	829	
Breeding Cattle	1	403.2	22	
Swine	7	3,150	350	
Horse	7	3,390	171	
Deer	1	1,102.5	180	
Bee	1	378	3,000	
Pest Animal	2	690	70	
Rabbit, Bird	1	431.6	6rooms	
Isolation	2	940.8	88	
Autopsy/Incineration	1	380.25	600kg/h	
Waste Water Disposal	1	540	6.5t//ea	
Fertilizer	1	585		
Office	2	1,534.8		
Livestock Products	3	1,445.17		freezer 235m²/35t refrigerator244m²/40t
Etc.	5	622.53		
Total	44	24,660.24		

Source: A study on procurement of alternative site for bulrodong quarantine station (2013).

Figure 4-10 | View of Yeongjongdo Quarantine Station

1. Fertilizer Station
2. Waste Water Treatment Station
3. Autopsy Station / Incineration Station
4. Electricity Building
5. Separation Sheds for Animals Affected by Disease
6. Livestock Products Quarantine Storage 1
7. Livestock Products Quarantine Storage 2
8. Non-beef Cattle Shed 5
9. Non-beef Cattle Shed 6
10. Non-beef Cattle Shed 1
11. Non-beef Cattle Shed 2
12. Non-beef Cattle Shed 8
13. Racing Horse Shed 1
14. Non-beef Cattle Shed 7
15. Non-beef Cattle Shed 3
16. Non-beef Cattle Shed 4
17. Non-beef Cattle Shed 9
18. Racing Horse Shed 1
19. Racing Horse Shed 2
20. Honey Bee Sheds1
21. Honey Bee Sheds 2
22. Management Building
23. Vehicle Disinfection Facility
24. Entry Control Room
25. Pig Shed 4
26. Pig Shed 5
26. Pig Shed 6
28. Pig Shed 1
29. Pig Shed 2
30. Pig Shed 3
31. Breeding Cattle Shed
32. Racing Horse Shed 2
33. Detained Deer Shed
34. Separated Deer Shed
35. Equipment Storage
36. Pet Shed
37. Office Building
38. Rabbit Shed, Bird Shed

Source: A study on procurement of alternative site for bulrodong quarantine station (2013).

b. Yeongnam Quarantine Station

Yeongnam Quarantine Station was originally located at Amnam-dong, Seo-gu, Busan, a city with a 100-year history. Due to facilities deterioration and the resulting limitations in operation, as well as development of the surrounding areas, a new building is under construction at Neodeori District in Jisa-dong, Gangseo-gu, an outskirt area of Busan. The Station at Amnam-dong consisted of the quarantine station, quarantine inspection room, laboratories and offices on a site area of 347,455m^2 and facilities area of 64,273m^2. A new station is being designed starting from 2012, and currently under construction, to

be completed in 2017. The quarantine station at the Neodeori District will consist of 41 buildings, including cattle sheds, horse sheds, pig sheds, and other holding facilities on a site area of 957,220m², and the total area of 13,716.37m².

Table 4-9 | Overview of Facilities at Yeongnam Quarantine Station (under construction)

Items	Description	Note
Location	San-48, Jisa-dong, Gangseo-gu, Busan	
Site Scale	957,220m² (facilities area 65,219m²)	
Building Scale	10,866.03m²	41 buildings
Total Scale	13,716.37m²	
Main Purpose	Animal quarantine	
Major Facilities	Quarantine Station, Animal Sheds, etc.	

Source: A study on procurement of alternative site for bulrodong quarantine station (2013).

c. Jeju Yonggang Quarantine Station

Yonggang Quarantine Station is a quarantine station for animals imported into the Jeju area, established in 1995. It consists of nine buildings on a site area of 34,875m² and a building area of 1,915m², including facilities for holding large-sized animals such as cattle and horses and medium-sized animals.

Table 4-10 | Overview of Facilities at Yongang Quarantine Station

Facility		Number	Scale (m²)	Note
① ② ③	Quarantine Station	3 (88 rooms)	1,350	7
⑤	Isolation	1 (10 rooms)	150	
④	Office	1	165	
⑥	Incineration	1	92	120kg/H
⑦	Fertilization	2	162	180t
⑧	Feed Storage	2	263	
	Total		2,182	

Source: A study on procurement of alternative site for bulrodong quarantine station (2013).

2.2. Plant Quarantine

2.2.1. Expansion of Plant Quarantine Organization

a. History of Plant Quarantine Institutions

On April 12, 1978, the Presidential Order on the organization of the 'National Plant Quarantine Station under the Ministry of Agriculture and Fishery' was announced, followed by its establishment located at Anyang 6-dong, Anyang-si with two departments, five dispatched offices, ten offices and 85 personnel. Five dispatched offices were promoted to branch offices in 1979, and 11 offices were promoted to dispatched offices in 1986.

The International Quarantine Information Department and Investigation and Research Department were established in 1990, along with additional four new dispatched offices. The Individual Cultivation Station opened in 1991, and three dispatched offices were setup under the Busan Branch Office in 1992. The Main Office expanded to include six departments (quarantine, international quarantine cooperation, disinfection, pest investigation, general affairs) in response to the WTO regime in 1994, and the task of each department was adjusted. Agricultural researchers were recruited in 1999 to acquire expert researchers, and another ten researchers were transferred from the Rural Development Agency.

The National Plant Quarantine Station was promoted to the National Plant Quarantine Agency in 2007, and the Agricultural and Fishery Quarantine Agency was established as an organization to supervise all matters related with animals and plants and fishery products quarantine, during the government reorganization in June 2011. As a result, the plant quarantine function was undertaken by the Plant Quarantine Department of the Agricultural, Forestry and Fishery Quarantine Agency, and the five branch agencies in Incheon Airport, Yeongnam, Jungu, Honam and Jeju were reorganized together with animal/fisheries quarantine into six regional agencies (Seoul Regional Agency was added).

The Operation Support Department was reorganized into a department directly under the Director, and the Plant Quarantine Division consisted of a plant quarantine department, export support department, risk management department and disaster prevention department. With the revision of the Government Organization Act in 2013, the fishery quarantine function was taken over by the Ministry of Oceans and Fisheries, and the Agency was reorganized into the Animal and Plant Quarantine Agency.

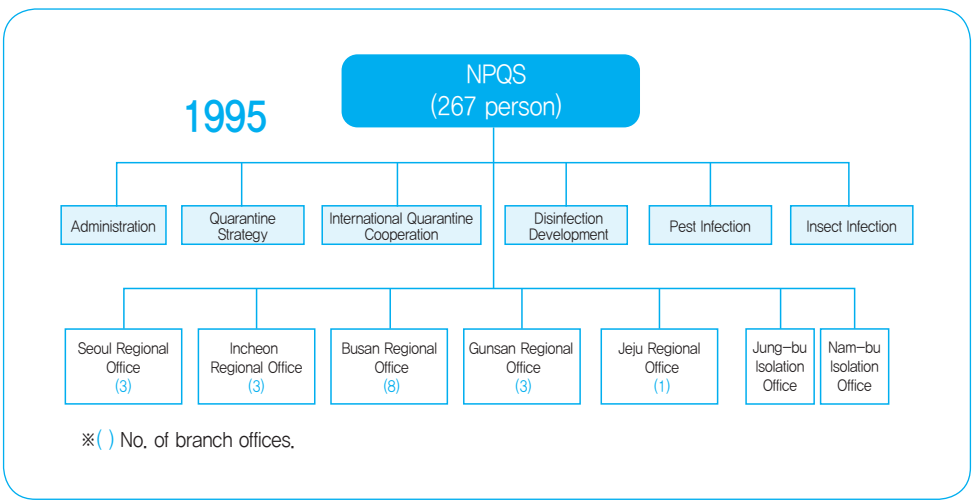
The Plant Quarantine Department is responsible for quarantine planning for imported plants, operation of regulations and system for imported plants, investigation on non-compliance with the Plant Protection Act. The Export Support Department is responsible

for quarantine planning and coordination for exported plants, operation of regulations and system for exported plants, international cooperation for plant quarantine, import permission conditions for import banned products, and collection of overseas plant quarantine information.

The Risk Management Department is responsible for supervising precision quarantine and management of pests affecting plant and wild weeds, establishing risk analysis and management standards, designating pests and wild weeds subject to regulation, border monitoring for LMO plants, supporting the development of plant quarantine technologies and managing pests information.

The Plant Disease/Pest Control Department monitors overseas pests and wild weeds, performs epidemiological investigations, quarantine on individually cultivated plants, sestablishes disinfection standards, manages disease/pet control companies and heat treatment companies, manages the computer network for plant quarantine and approves/ manages import of importation banned products.

Figure 4-11 | Plant Quarantine Agencies in 1995



Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

2.2.2. Acquisition of Plant Quarantine Workforce

On April 12, 1978, the Presidential Order on the organization of 'National Plant Quarantine Station under the Ministry of Agriculture and Fishery' was announced, followed by its establishment located at Anyang 6-dong, Anyang-si with two departments, five dispatched offices, ten offices and 85 personnel. Subsequently, the number of personnel grew from 85 to 267 in 1995. Considering the relative recess of the agricultural/forestry industry, such expansion was truly unexpected.

The plant quarantine workforce kept growing after 1995, reaching 451 in 2007. It was followed by a reduction/expansion caused by reorganization or workload increase. In 2014, the number of personnel was 445. In particular, 297 agricultural experts were employed through special recruitment. The researcher position was introduced in 1999 to further enhance the expertise of the organization.

Of 445 personnel, there are 356 in the agricultural positions, responsible for plant quarantine investigation, and 23 in the researcher positions, responsible for researches and laboratories.

Table 4-11 | Workforce Status by Year

(Unit: persons)

Items	'93~'95	'96~'97	'98	'99	'00	'01	'02	'03	'04	'05
Increased	694	694	694	694	-	694	-	6	694	1
Total	694	694	694	694	694	694	694	694	694	694
Items	**'06**	**'07**	**'08**	**'09**	**'10**	**'11**	**'12**	**'13**	**'14**	
Increased	694	694	△25	6	-	△5	△1	0	694	
Total	694	694	694	432	432	694	694	694	434	

Source: Aniaml and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

2.2.3. Reinforcement of Plant Quarantine Facilities and Equipments

a. Facilities and Equipments before WTO

After a suspension, the plant quarantine work resumed in 1959, without any independent organization or even offices. Enactment of the Plant Protection Act in 1961 and the establishment of the central organization, however, made it possible to perform basic quarantine works. The resident plant quarantine officer's office had a single-lens optical microscope, fixed-rate anatomical microscope set and dry heat sterilizer. The compensation

received from Japan after the Korea-Japan Agreement was used to purchase optical microscopes and dissecting microscopes.

The South Korean government and the UN FAO signed an agreement for the Crop Protection Research and Training Reinforcement Project (KOR-32) in 1961 as part of the UN Development Plan (special fund), based on which a total of $22,500 subsidies was given to plant quarantine offices across the nation. The National Plant Quarantine Station eventually acquire optical microscopes, dissecting microscopes, heat sterilizers, dry sterilizers, centrifuges, water distillers, gas meters, gas leakage meters and gas masks. (20-type, 83 units). The Station did not have any laboratory at the time. Subsequently, there was no marked increase of equipments until 1984.

From 1985 to 1987, as part of the modernization plan for open ports, new equipments were acquired or replaced including: electronic microscopes, fluorescent microscopes, optical and dissecting microscopes, X-ray vision, vacuum fumigator, crusher, gas density meter and computers. The modernization plan for open ports was a plan to prepare for the 1986 Asian Games and 1988 Olympic Games, which was an opportunity to acquire a considerable number of equipments within a short period of time. Local branches, however, had yet to benefit from such modernization.

With the budget of 441,000,000 KRW acquired through a UNDP project titled 'South Korea Plant Quarantine Reinforcement Project (ROK/87.007)', consumable equipments including portable magnifying glasses, multi-purpose knives and insect collection apparatuses were acquired for use in on-site inspection by all personnel.

Table 4-12 | Quarantine Equipments Secured per Open Port Modernization Project

(Unit: units)

Item	'86	'84~'85	Total
Electronic Microscope	2대	- 대	2대
Florescent Microscope	2	6	8
Optical·stereocopic Microscope	12	28	40
Thermo Hygrostat	4	15	19
X-Ray	-	6	6
Vapor Heat Treatment Device	3	4	7
Computer	2	-	2
Etc.	179	455	634
Total	204 (404 million Won)	514 (657 million Won)	718 (1,061 million Won)

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

b. Reinforcement of Plant Quarantine Facilities and Equipments

During Phase 1 of the Plant Quarantine Reinforcement Project (1993~1995), 0.9 billion KRW was invested to construct the building of the Incheon Branch Station in 1994 (total area 1,469m^2, 3-story ground and 1-story underground), and acquired the Central Individual Cultivation Station site of 38,231m^2. The equipments acquired were mostly testers, gas chromatographic and other advanced quarantine equipments. During Phase 2 (1996~1997), 4 billion KRW was invested to acquire the Southern Individual Cultivation Station site of 25,060m^2 at Gimhae-si, Gyeongsangnam-do and new buildings were constructed for the Diseases/Pests Classification Center (total area 799m^2, 2-story ground and 1-story underground) and Gunsan Branch Station (total area 1,469m^2, 3-story ground and 1-story underground. High-performance equipments were now being supplied to local quarantine agencies, and the visual analysis system was capable of monitoring and exchanging microscope image between the Main Station and the Branch/Dispatched Stations. During Phase 3 (1988~2006), new buildings were constructed for the Jeju Branch Station and Southern Individual Cultivation Station. PCR (genetic analysis) and other equipments were acquired at the time, along with the introduction of the biolog system and distribution of ELISA equipments to branch/dispatched stations.

In keeping with recent scientific developments after 2000, many efforts were made to acquire molecular biological tests, laptops and PDA's. PCR tester's, electrophoresis devices, bacteria testers, dissecting and optical microscopes, high-pressure sterilizers and sterile stands were purchased, an investment in replacing deteriorated equipment was also made. In 2003~2004, image analysis devices, grain sample collectors, real-tie PCR, digital cameras, seed crusher and CCD cameras were mainly purchased. Subsequently, efforts have concentrated on replacing deteriorated equipments and expanding the number of equipment in newly constructed offices.

Table 4-13 | Yearly List of Quarantine Equipments Secured and Budgets Invested (1978~2007)

Year	Purchase Budget (unit: thousand Won)	Major Items
1978	UNDP	11kinds 84ea (Optical microscope etc.)
1984~1986	1,061,000	10kinds 73ea (X-ray etc.)
1987~1992	250,000	29kinds 114ea (electronic microscope etc.)
1993~1995	3,166,000	37kinds 337ea (Elisa etc.)
1996~1997	4,845,000	59kinds 591ea (electronic microscope etc.)
1998~2000	5,512,000	58kinds 591ea (electronic microscope etc.)
2001~2002	1,944,820	82kinds 452ea (gene amplifier etc.)
2003~2004	1,420,050	65kinds 228ea (image analyzer etc.)
2005~2006	1,405,735	60kinds 389ea (gene amplifier etc.)
2007	830,000	56kinds 557ea (network device etc.)

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

Table 4-14 | Current Status of Quarantine Equipments

Entry into quarantine station		Number of Equipments Retained (units)	Usage
Major Equipments	Electronic Microscope	12	Pests Classification
	Laser Microscope	6	Pests Classification
	Gas Chromatography	4	Separation /Detection of Sample Ingredients
	Spectrophotometer	9	Density Measurement of Sample Ingredients and Pathogens
	Vapor Heat Treatment device	9	Pests Extermination
	Gene Amplifier	694	Virus classification
	Others Equipments (30 million or above)	41	Precision Inspection Device for Pests
General Equipments (including optical & dissecting microscope)		1,457	Laboratory Inspection Equipments

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

Figure 4-12 | Facilities Arrangement and View of Southern Poste Entry Station (Currently, Gimhae Office, Yeongnam Regional Agency)

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

Table 4-15 | Overview of Facilities at Southern Post entry

Facilities	Areas (m²)	
Office Building	1 buildings	607
Greenhouse	2 buildings	619
Network Room	8 building	1,320
Warehouse	1 building	330
Reserve Packaging	-	1,340
Total	8 building	4,216

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

3. Domestic/Overseas Training Aimed at Fostering Quarantine Experts

3.1. Training of Animal Quarantine Experts

3.1.1. Necessity of Training Expert Workforce

For quarantine works, it is imperative to acquire an expert workforce with the appropriate expertise and skills. In particular, the UR/SRS agreement requires that such measures are scientifically justified. Therefore, advancement of quarantine work demands training and securing of an expert workforce.

3.1.2. Recruitment

In South Korea, only persons with a veterinary license can work as animal quarantine officers. Veterinarians are usually employed as animal quarantine officers (7^{th} grade public officer position). Thus, it is relatively easier to acquire experts compared with other fields. However, a workforce with more expertise was needed in the late 1980's, when the animal quarantine works were expanded and diversified to include livestock product safety, analysis on hazardous residues including antibiotics and food microorganism inspection.

Accordingly, the open test system was adopted in 1987, and the special recruitment expanded to include those with analytic chemistry and toxicology degrees other than those majoring in veterinary microorganisms, contagious diseases and pathology, so as to secure expertise that fit the new demands for quarantine works.

3.1.3. Domestic/Overseas Training

a. Domestic Training

As the imports of livestock products rapidly increased after the 1990's, the people's demand for quarantine came to include safety of imported foods, making it imperative to acquire expertise on hazardous residues including antibiotics. Thus, the method of employment was diversified, and domestic/overseas training was provided to existing employees to enhance their expert capabilities.

Domestic training included short-term programs for improving expertise in relatively under-developed areas. In particular, 22 quarantine officers received training on analysis of residue contained in livestock products, and acquired expert knowledge on analytic chemistry including HPLC, GC, GC/MS, ICP, under a project run by the Doping Control Center at the Korea Institute of Science and Technology (KIST). In addition, employees were encouraged to participate in training sessions, seminars and workshops organized by universities and research institutes, as well as to enroll into graduate schools. Experts in each field, including professors, were appointed as external consultants for improving the expertise of quarantine officers.

b. Overseas Training

Expansion of free trade in 1995 generated the need for training of experts in various fields ranging from administrative organization, international cooperation (commerce) and a precision inspection system. In order to acquire the required technologies, employees of quarantine agencies were dispatched to overseas research institutes, to acquire the know-how of the advanced quarantine system through short or long-term overseas technological training.

In 1990, an employee was dispatched to a government analysis research institute in Australia for the first time to receive training on the residue analysis method. Subsequently, training at advanced research institutes in each field located in the US, France, Canada and the UK continued, which contributed to improving the level of South Korea's quarantine system.

After the 2000's, employees were being sent in the form of long-term dispatched postings to international organizations (OIE, FAO) to help acquire animal quarantine information and international cooperation.

The table below shows key overseas training sessions after the 1990's.

Table 4-16 | Overseas Technological Training Received by Animal Quarantine Officers

(Unit: persons)

Training Area	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Total
Quarantine System	10	5	0	5	4	8	32
Inspection for Infectious Diseases	13	15	4	2			34
Livestock Products Safety	14	14	3	6	11	4	52
Total	37	34	7	13	15	12	118

Source: National Veterinary Research and Quarantine Service (NVRQS), Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6), History of NVRQS (2009).

3.2. Training of Plant Quarantine Experts

3.2.1. Early Education for Plant Quarantine Officers

The first education for plant quarantine officers was the basic education provided for the newly recruited 23 agriculture/forestry technology administration personnel in 1959 at the Basic Research Department, Plant Environment Research Institute of Rural Development Agency. They were trained on plant pathology, agricultural entomology and pesticides. It was followed by a one-week plant quarantine education session for 30 newly recruited plant quarantine personnel in 1962, 15 personnel in 1964, and the newly recruited 82 monitoring personnel in 1965. After the Plant Protection Department was setup under the Ministry of Agriculture and Forestry in 967, frequent supplementary education was conducted to improve capabilities of the quarantine personnel. In accordance with the UNDP plan for technological training for plant quarantine personnel, 12 plant quarantine personnel received basic education on plant quarantine, pests monitoring and prevention from the Crop Protection Research Reinforcement Project Agency under the Rural Development Agency. Quarantine personnel at each station received one-month basic education on pathology and entomology at the Agricultural Technology Research Institute of the Rural Development Agency.

3.2.2. Development of Interior Education for Plant Quarantine Officers

After the establishment of the Plant Quarantine Station in 1978, internal education was performed in tandem with commissioned education. Two internal training sessions were held in 1978 on plant pests diagnosis, classification and monitoring of harmful animals and plants, pests sample making, as well as one training session on methyl bromide disinfection safety. In 1979, four plant quarantine officers were selected from each of following four areas: nematode, virus, pathology, insect rearing and sample making, to receive technological training. Twenty plant quarantine officers received quarantine education for designated seed plants in 1980, which involved fruit tree packaging/management, pests test for fruit trees, and the Plant Protection Act and quarantine on designated seed plants. 'Technological Education with Experts' was held from 1981 to 1985 with Woo, Geon-seok, Professor, Seoul National University College of Agriculture, which covered both theories and practices of pest search on imported trees, such as isoptera, boring pests, beetles and wood borer, among others. Technological training sessions for quarantine personnel was provided, which covered anti-serum and other methods of virus detection and individual cultivation of pathogens. Similar education was provided for disease prevention technicians for exported/imported plants and supervisors. These trainings usually covered relevant laws, prevention of harm caused by fulmination disinfection, theory and practice of fulmination, and on-site practices. Five quarantine officers were selected for a four-week commissioned education at the Forestry Testing Ground, Seoul National University, Kyungsang University and Jeju University, each quarantine officer received training on growth and ecology of nematode and wood pests, their classification, plant pathology and pests affecting tangerines. The Agricultural Technology Institute was commissioned with plant pathology and entomology education for two plant quarantine officers in 1983, and five quarantine officers were selected for commissioned education at the Agricultural Technology Institute, Chungnam University, Gyungbuk University and Jeju University, to improve the quality of their work and their scientific backgrounds. During the period from 1986~1990, education and practices regarding plant quarantine laws and pests classification and monitoring were provided during recruit training sessions, accompanied with frequent education sessions with experts.

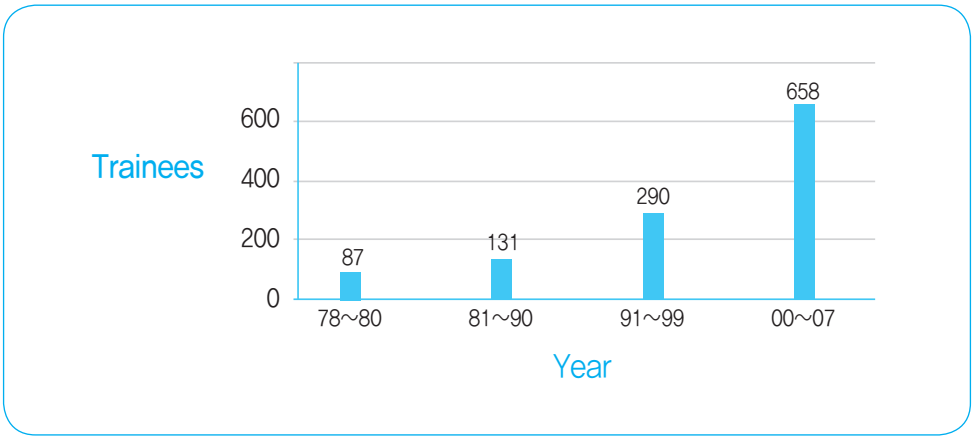
Although internal education began with the plant quarantine itself at the Plant Quarantine Station, the true beginning of plant quarantine officer training began with the Plant Protection Act enacted in December 1995, and the Instructions for Selection and Operation of Plant

Quarantine Officers, enacted in December 1996. A variety of courses were introduced from 1996 to 2000, and recruit training was held for new special recruits and former employees from 1998 to 2000.

To be specific, the courses consisted of the New Recruit Class, Basic Plant Quarantine Class, Plant Quarantine Practice Class, Expert Plant Quarantine Class and Plant Quarantine Management Class. New Recruit Class was designed to allow new recruits to learn general and expert knowledge, under the purpose of establishing their values, basic knowledge and work capabilities regarding plant quarantine. Basic Plant Quarantine Class was provided for plant quarantine officers in their first or second year who have finished the New Recruit Class, to further enhance their understanding of basic theories. Plant Quarantine Practice Class was provided for plant quarantine officers in their second or third year and have finished the Basic Plant Quarantine Class, to train experienced working-level experts for on-site quarantine. Plant Quarantine Practice Class was provided for plant quarantine officers in their second or third year and have finished the Basic Plant Quarantine Class, to train experienced working-level experts for on-site quarantine and precision inspection. Plant Quarantine Management Class was provided for plant quarantine officers in their second or third year (7~11 years after employment) and have finished the Expert Plant Quarantine Class, to train middle-management personnel for on-site quarantine. The period of training was eight weeks for Basic Plant Quarantine Class, two~four weeks for Plant Quarantine Practice Class, and two weeks for the other two classes. Education through each class continued from 2000 to 2005.

In 2007, the Plant Protection Act was revised to allow local governments to have their own plant quarantine officers. Accordingly, a new introductory course was created to help prepare for the plant quarantine officer license and plant protection technician license. In 2006 and 2007, the number of trainees rapidly increased due to employment of new recruits, and the LMO's were added to the Practice Class to prepare for changes in the plant quarantine environment.

Figure 4-13 | Number of Plant Quarantine Officer Trainees by Year



Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

3.2.3. Adoption of Plant Protection Officer License System

The emergence of the WTO regime in 1995 generated the need to adopt a system for plant protection officer licensing: the window has widened for imported agricultural products, increasing the possibility of introduction of foreign pests, and the relevant international conventions had provided that future quarantine measures be based on scientific evidences.

The revision of the Plant Protection Act on December 6, 1995 set down the legal basis for full adoption of the qualification system for plant quarantine officers. Pursuant to Articles 3 and 5 of the Plant Protection Act and Article 4 of the Enforcement Rules thereof, the Instructions on Qualification Test for Plant Quarantine Officers and its Operation were enacted as the Food Inspection Regulation No. 57 (December 16, 1996). Those eligible for the test were persons who worked at plant quarantine stations for no less than a year as of the date of the test, and the test consisted of written tests and practice tests. The written tests covered relevant laws, pathology, insects, disinfection and wild weeds. The practice tests tested the testers using pest samples or photographs.

Those who passed the plant quarantine officer qualification test were allowed to provide pass/rejection judgment, issue disinfection/disposal orders and perform other plant quarantine works. They were also provided additional pointson their performance reviews and given priorities regarding the application for overseas training or transfer. The Instructions on Qualification Test for Plant Quarantine Officers and its Operation were revised by Food Inspection Regulation No. 60 as of December 30, 1997.

Those who acquired plant quarantine officer qualification could issue certificates or confirmations under his/her own name. Those without qualifications could not perform plant quarantine works on their own, but were allowed to work as inspection assistants. Those eligible for the plant quarantine officer qualification test were plant quarantine public servants of Grade 5 or below, who worked at plant quarantine stations for no less than a year as of the date of the test.

In order to provide specifics for qualifications tests, as well as authorities and expert training/education of plant quarantine officers qualified through the test under Article 4 of the Enforcement Rule of the Plant Protection Act, the Instructions on Qualification Test for Plant Quarantine Officers and its Operation were revised by the Food Inspection Regulation No. 101 as of September 16, 2003. According to the revised Instructions, those eligible to take the test were those who worked at plant quarantine stations for no less than six months as of the date of the test, those who finished the recruiting class of the expert training course, and those who should re-take the test under the relevant regulations. That is, the working period required for eligibility was reduced from one year to six months.

Those who passed the qualification test were issued a plant quarantine officer identification, and their signatures were registered at the plant quarantine officer autograph registry. Those who acquired the plant quarantine officer qualification were given authorities specified by the relevant regulations, and were allowed to conduct export/imported plant inspection on their own, and take various actions and issue certifications thereof: result certification of preliminary tests, notification of separate cultivation, designation and confirmation of regular separate cultivation/packaging, order of separate cultivation, pass certificate of imported plants inspection, pass certificate of exported plants inspection, disinfection, disposal and return. The authorities of those qualified as plant quarantine officers could be exercised by imprinting the seal with their names and signing their names, or imprinting the pass seal and signing their names. The names had to be signed using blue ballpoint pens. The pass certificate of imported plants had to be approved by the head of the agency before issuance, while the pass certificate of exported plants could be issued before approval from the head of the agency.

Table 4-17 | Operation Result of Qualification Screening System for Plant Quarantine Officers

	1	2	3	4	5	6	7	8	9	10	11	12	13
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Persons Passed	175	25	30	61	15	22	28	17	9	9	12	15	32

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

3.2.4. Overseas Training

Effective performance of plant quarantine works require extensive knowledge on plants and pests, as well as precise classification, disinfection and disease control. In consideration of such characteristics of plant quarantine works, South Korea has been encouraging its quarantine officers to receive overseas training so as to foster experts in each field.

Overseas training began to be provided in 1963 for a number of employees. As a part of the UNDP 'Project for Plant Quarantine Reinforcement in South Korea (1988~1989)', employees were given the opportunity to receive training on pest classification, quarantine systems and facilities at overseas agencies. Four plant quarantine experts were invited from overseas to provide technological training on pest classification and other matters, followed by pest investigation on major fruit trees and report publication. Four to ten personnel received overseas training each year from 1986 to 1977. However, as South Korea elevated its level of quarantine system and technologies, the demand for overseas training subsided, with around two personnel receiving short-term overseas training on special areas each year.

Table 4-18 | Overseas Training Received by Plant Quarantine Officers

		Total (person)	~1885	1986~1990	1991~1995	1996~2000	2001~2005
No. of Trainee		85	14	16	21	23	11
Field	Disease	18	2	4	3	5	4
	Pests	17	-	4	5	8	-
	Overall	17	9	3	2	-	3
	Etc.	33	3	5	11	10	4

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008).

4. Construction of Quarantine Computerization and Information System

4.1. Animal Quarantine

4.1.1. Background

Database construction and computerization of quarantine information was implemented to actively adjust to the rapidly changing quarantine environment due to an increase of animals,imports, and consumption, as well as the improvement of the relevant systems and laws.

The Korea Animal Quarantine Information System (KAQIS) was developed in 1995 during Phase 1 of the Animal Quarantine Function Reinforcement Project, and began operation on January 1, 1996. KAQIS began as a system for handling civil complaints for quarantine requests and quarantine certificate issuance. Later, the Automated Import Information System (AIIS) was introduced to eradicate any wrong handling of quarantine works. Starting from 1998, quarantine results were transmitted to the Korea Customs Service through Electronic Data Interchange (EDI) to proceed with the customs procedure, which greatly improved the convenience of complainants.

In addition, an electronic payment/complaint system was established to allow for on-line requests and payments, and a data warehouse (DW) was setup to improve timeliness and efficacy of non-regular and non-typical statistical information, caused by safety issues related with imported livestock products, so as to provide better information.

KAQIS can be considered an integrative information system constructed for the purpose of enabling on-line requests for animal/livestock products quarantine, receiving the requests by quarantine officers, and issuance of quarantine certificates and submission of the results to Korea Customs Service through EDI, thereby achieving computerization of the overall quarantine administration.

In addition, after the foot & mouth disease outbreak in 2010, the Board Quarantine Management System (BQMS) system was established when the Central Epidemiological Investigation Committee pointed out foreign workers and farm owners travelling overseas as possible causes for the outbreak.

Also, construction of the Korea Animal Health Integrated System (KAHIS) began in 2008: it was completed in 2012, and began its operation in January 2013.

4.1.2. Progress of Adoption

a. Establishment of KAQIS

As the Ministry of Agriculture and Forestry took over sanitation management for the butchery business and mil collection business in accordance with the Livestock Product Processing and Treatment Act (effectuated in 1998) and livestock products processing, storage, transportation and sales businesses in accordance with the Food Sanitation Act, thus taking charge of general matters from livestock growth (import) to consumption (farm to table), the KAQIS system went through major changes to account for exported/imported livestock product quarantine.

The progress can be summarized as follows, starting from the first construction of the system.

° 1996: On-line quarantine request and quarantine certificate issuance for quarantine animals/livestock products

- Phase 1: Operation of livestock products quarantine information system for exported/imported animals/livestock products (1996~June 14th 1998)

- Phase 2: Took over inspection work from the Ministry of Welfare in accordance with the Livestock Product Processing and Treatment Act, and operated quarantine requests (non-food products) and import declaration (food products)

° 1998: Operated quarantine certificate EDI and import declaration system

° 2001: Improved AIIS for imported livestock products through replacement of the main computer devices

- Automated random inspection plan established for imported livestock products not included in the random plan information

- Automated designation and management of object of reinforcement inspection

° 2002: Re-constructed web-based quarantine information system, adopted LIMS and constructed cargo manifest EDI system

° 2003: Constructed quarantine inspection D/W system and Internet request system

° 2006: Partially improved the system through replacement of the main computer devices

- Improved the complainant system including provision of the overseas local site status, and constructed/operated the quarantine reservation system for exported pet animals.
- Constructed quarantine inspection D/W system (non-typical statistics system) (November 2006)

° 2006: Constructed and operated the Single Window System in conjunction with Customs Service

- Established the import logistics system (March '06), followed by export logistics system (March 2007)

°2007: Established the random inspection and onsite quarantine assistance system

° 2008: Constructed automated precision inspection fee calculation system, and the reinforcement inspection system for US beef (products)

° 2009: Constituted the cargo manifest system for imported goods in conjunction with Customs Service

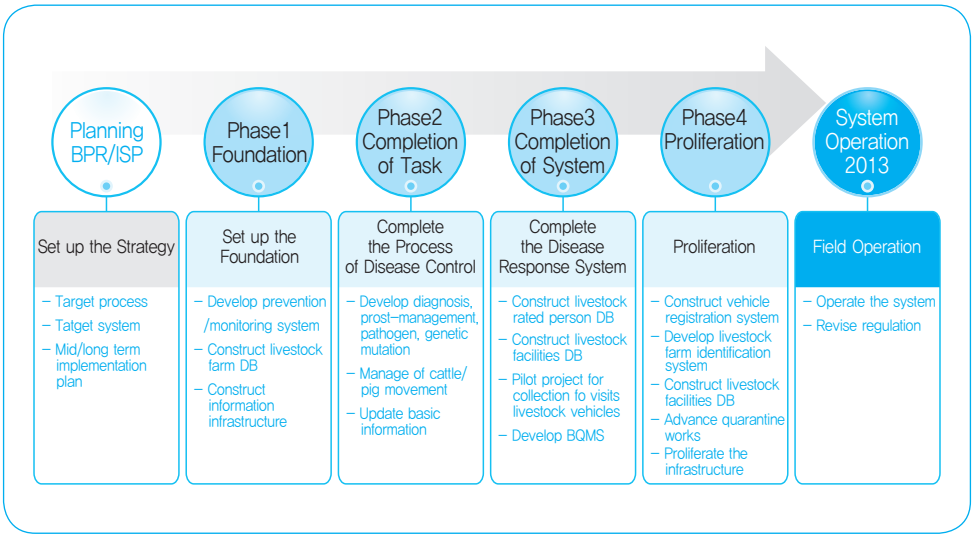
° 2012: Quarantine Information System Server Replacement and Improvement of Work Information System

- Constructed the system for rabies antibody inspection request (October 2012)
- Quarantine request system for special delivery cargo, Internet request system for exclusion from quarantine object, quarantine payment system (March 2013)

b. Construction of KAHIS and BQMS

KAHIS construction began in 2008, was completed in 2012 and KAHIS began operating in January 2013, to provide prevention of livestock diseases and support for rapid protection measures. It is used by approximately 10,000 users, including local government, civil disease prevention personnel, Ministry of Agriculture and Food, and quarantine agencies.

Figure 4-14 | Roadmap for KAHIS Construction



Source: Internal data of Animal and Plant Quarantine Agency.

When three foot & mouth disease outbreaks caused massive economic and psychological damages in 2010, the BQMS was established in 2011 to enforce mandatory entry/exit reports for livestock-related personnel travelling to countries with livestock disease outbreaks, and allowed for declaration and disinfection management at airports and ports. BQMS began operating in July 2011, followed by the adoption of kiosks and the passport-reader system, which reduced stand-by time and improved convenience for quarantine officers.

BQMS provides real-time border quarantine information in conjunction with KAHIS, and the local government can verify those who failed to report and register domestic protection actions and their results by logging into KAHIS.

4.1.3. Animal and Livestock Products Quarantine and Border Quarantine Systems

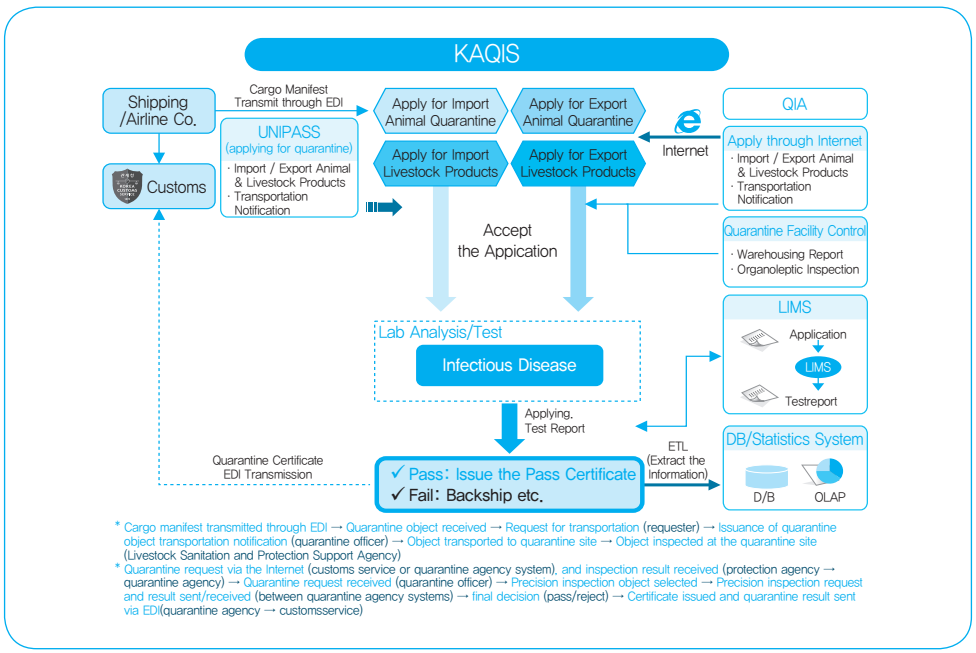
a. KAQIS

° Server Environment: IBM-UNIX, Windows Server, etc.

° D/B Environment: Sybase ASE, Sybase ASIQ, Oracle, MS-SQL

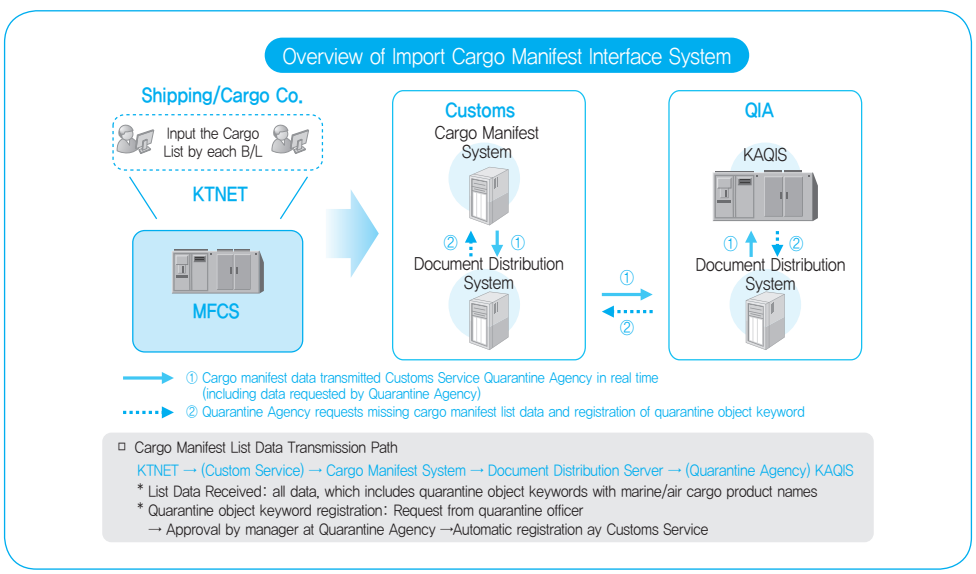
° Middleware Environment: Websphere, etc.

Figure 4-15 | Operating System for Animal/Livestock Products Quarantine Information System



Source: Internal data of Animal and Plant Quarantine Agency.

Figure 4-16 | Overview of Link System between KAQIS and Korea Customs Service



Source: Internal data of Animal and Plant Quarantine Agency.

b. Construction of KAHIS and BQMS

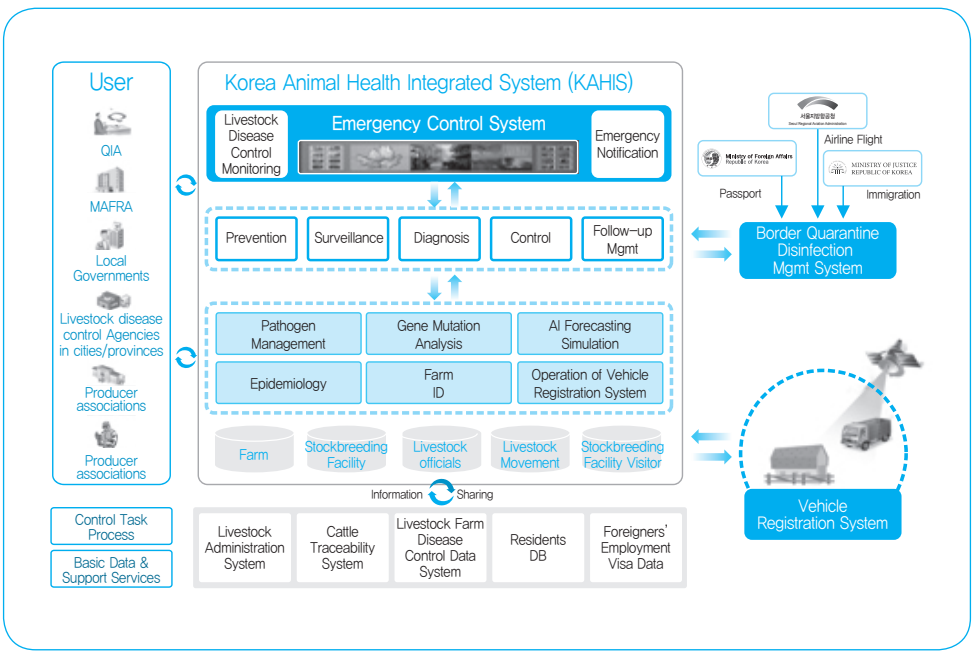
○ KAHIS

° Server Environment: IBM-UNIX, Windows Server, etc.

° D/B Environment: Oracle 11g

° Middleware Environment: Jeus, WebtoB

Figure 4-17 | Overview of Korea Animal Health Integrated System (KAHIS)



Source: Internal data of Animal and Plant Quarantine Agency.

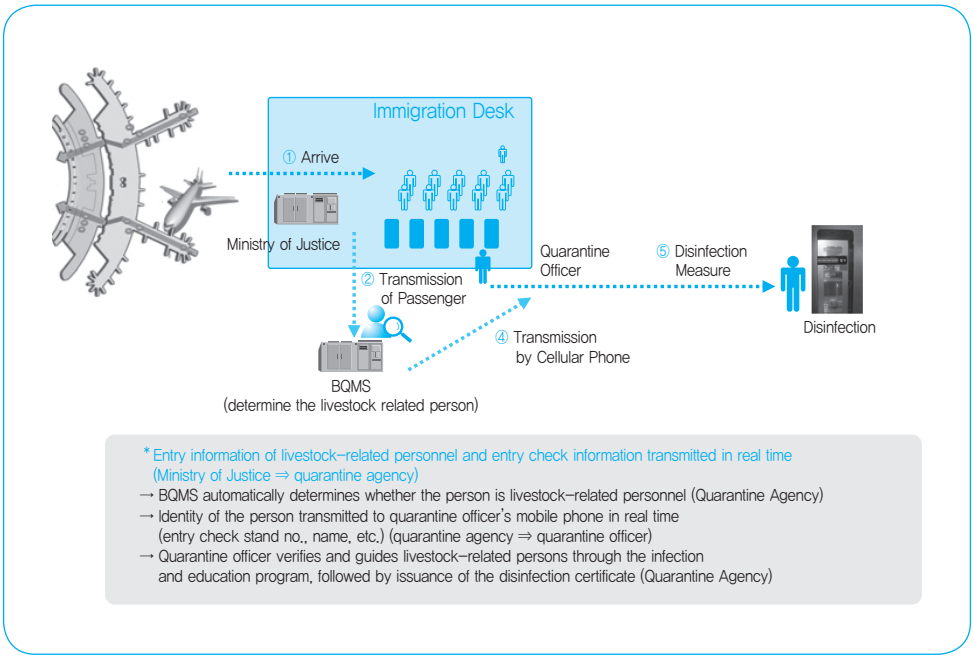
○ BQMS

° Server Environment: HP-UNIX, Windows Server, Storage, etc.

° D/B Environment: Sybase ASE Cluster Edition, Sybase SBE

° Middleware Environment: Jeus, etc.

Figure 4-18 | Overview of Border Quarantine Management System (BQMS) for Livestock-related Persons



Source: Internal data of Animal and Plant Quarantine Agency.

4.1.4. Outcome and Evaluation of the Systems

Globalization and the opening of the domestic market after the 1990's led to a drastic growth of goods and personnel exchange, including animals and livestock products. South Korea responded to these changes by developing and utilizing computer systems suitable for circumstances of the region. Computerization resulted in boosting the work speed and efficiency, as well as scientification and standardization. It also enhanced accessibility and convenience for the citizens, and played a significant role in improving transparency and objectivity of quarantine works.

a. Response to Quantitative Growth of Quarantine Volume

a) Efficient Quarantine Work Processing through Advancement of KAQIS

The Korea Animal Quarantine Information System (KAQIS), developed and deployed in 1996, marked the beginning of meaningful computerization of quarantine application reception and certificate issuance. This computer-based work processing system is attributed

for achieving a low-price/high-efficiency response to an increased volume of quarantine objects after opening the domestic market.

In addition, the quarantine site information management system was established to assist the management of the result of quarantine object inspections and real-time identification of stocks during warehousing/discharge. Various computer systems related with KAQIS were organically interfaced to form the basis for efficient work performance: interfacing/reception of quarantine objects list from Korea Customs Service (18,000 items per day), quarantine applications for express delivery items, judgment of exception to quarantine (120,000 cases per year), shipment notifications for entry of exported/imported quarantine objects into quarantine sites (60,000 cases per year), and inspection applications and result data management for rabies antibiotics in exported/imported animals. Also, computerization of records and history of rejected animals and livestock products led to efficient document management and timely and precise recalls.

b) Formation of the Basis for Quarantine Scientification

Automated Import Information System (AIIS) designates the items subject to precision inspection automatically based on the volume of import of specific items and the size of samples sufficient to ensure stability of the inspection results calculated by the computer. This prevents possible wrongdoing or errors committed by the inspector and his/her arbitrary samplings, and ensures a more scientific and objective means of safety of imported livestock products.

Laboratory Information Management System (LIMS) forms a database containing overall precision inspection processes ranging from application reception, processing, result notification and statistics processing, as well as the relevant information, so as to achieve efficient and transparent management of lab tests. This system automates and scientifically processes the progress status from sample reception, sample assignment and report issuance, as well as the experiments themselves.

c) Formation of the Basis for Reinforcement of Border Quarantine through Conjunction with Domestic Disinfection

The Border Quarantine Management System (BQMS) was a system developed in 2011 for the purpose of managing livestock-related persons travelling overseas, who form relatively high-risk groups, starting from the exit/entry point. The system controls release of malignant contagious diseases by selecting and managing persons to be disinfected at their points of entry - airports or ports - from countries with livestock disease occurrences

such as FMD. The system automatically selected 53,000 livestock-related persons in 2013, 99.9% of which were disinfected. The system is interfaced with the KAHIS to allow for registration of disinfections and results thereof received by those who did not declare their entry, thereby contributing to eliminating the possibility of overseas livestock diseases being released into South Korea.

b. More Convenient Application Process

a) Reduction of Time Required through Internet Submission

Adoption of the computer system-based quarantine work process greatly increased the ease of submitting applications. While a person had to request quarantine by submitting a hard copy of the application to the relevant Regional Agency or office in the past, the introduction of the online submission system reduced the time required for quarantine application from 30~60 minutes to less than five minutes. Omission of application submission and personal visits to the offices greatly reduced the time and cost required of the applicants, and the information on how to process the applications can be viewed from the website, which increases transparency of the overall processing work.

b) One-stop Custom Clearance through Interface with Korea Customs Service Computer System

Designated quarantine objects can only be imported/exported through custom clearance by the Korea Customs Service. KAQIS has been linked with the electronic customs clearance system (UNIPASS) of Korea Customs Service, to make it easier for applicants to go through customs depending on the result of import quarantine. In addition, the quarantine certificate issuance process was streamlined in 1998, to directly transmit certificates to Korea Customs Service using the computer system.

c) Timely and Precise Quarantine through Export Quarantine Certificate Pre-reservation System

To increase convenience for applicants who seek to exit South Korea with pets, the Pre-reservation System for exported pets was established to allow for online applications. The system allows applicants to have the certificate issued on the day of departure, thereby reducing the time spent by waiting and distributing the application workload, which tends to drastically increase during certain periods.

4.2. Plant Quarantine

4.2.1. History of Plant Quarantine Information

Computers were first adopted by public agencies in the early 1990's, but this can not be considered as real information as the computers at the time were mere administrative tools for simple data input/output. After the Promotion of Information Plan was established in 1996, databases, medium-sized computers and internal communication networks began to be constructed. Construction of the Plant System (PL) in 1996 marked the true beginning of information of quarantine works. The PL system handled computation of plant quarantine works via servers constructed separately for each branch/dispatched stations, and only summary data were transmitted to the main computer system at the head station.

The spread of Internet use after the construction of high-speed national information network in 2001 led to the reconstruction of the PL system into an Internet-based, central-processing, real-time data processing system, which marked the moment of unprecedented development of plant quarantine information.

An Internet application system, which allows applicants - importers or agencies - to apply for inspection and view status updates anywhere without personally visiting plant quarantine stations, was constructed and linked with the PL system. The online application system reduced the time and cost required for inspection application, while reducing the workload for quarantine officers by eliminating the need to input application data and take phone calls, thereby increasing efficiency of administration.

The pests information system was established in 2005. It was a database that contained all information and quarantine statistics data to be used by all quarantine officers in real time.

Also, the 'Quarantine Site Real-time Data Processing System' was developed: the system allowed for on-site input/processing of inspection results from the quarantine sites using SMS services and PDA's to notify applicants of their applications' current progress via cell phones and notification of the results to Korea Customs Service through EDI. This drastically reduced the time required to process the inspection results, and reduced the cost incurred to applicants by having to wait for customs clearance. The Comprehensive Plant Quarantine Information System, which allows access to all quarantine information in existing systems with just a single connection, was established in 2006, and Web Robots were introduced for regular and automatic collection of the latest information in and outside South Korea.

In 2007, the Remote Pests Diagnosis Network was adopted: the system eliminated the previous need for sending samples to or visiting pest experts for diagnosis, and allowed for remote diagnosis through the video conference system. Also, additional programs for management of plant disease prevention companies, honorary plant quarantine observers, quarantine sites and LMO inspection were developed to assist quarantine works.

Table 4-19 | Annual List of Major Computer Systems Adopted

Adopted in	System Name	Adopted in	System Name
'96	Plant Quarantine Information System	'03	Internet Inspection Request System
'98	Disease/Pests Information System	'04	Electronic Sanitation Certificate System
'98	EDI System	'05	Real-time Data Processing System
'99	Homepage	'05	Innovation Management System
'00	Electronic Payment System	'05	Work Output Management System
'01	E-mail System	'06	Portal System
'01	Library Management System	'11~	Integrated Plant Quarantine System

Source: National Plant Quarantine Agency, History of Plant Quarantine (2008), Animal and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

4.2.2. Development of Plant Quarantine Processing System and Acquisition of ISO 9001 Certificate

The six computer system completed from 2004 to 2007 enabled one-stop processing of the overall system, from the request for inspection to the issuance of export/import permits. This system was branded 'QIPS.' QIPS stands for Quarantine Inspection Process System: the system reinforces customer service by improving efficiency of export/import quarantine work and providing various information.

In 2007, in recognition of the overall quality of exported/imported plant quarantine management, three branch stations received ISO 9001 (Quality Management Certification) from the International Standardization Organization. ISO 9001 substantiated the transparency and reliability of plant quarantine services.

4.2.3. Inspection Request for Exported/Imported Plants and Issuance of Certificate

The EDI system constructed between plant quarantine stations and the Korea Customs Service in 1998 eliminated the need for paper documents, as the system used electronic documents to send certificates to the Service. In 2001, the web-based work process and reporting tools enabled real-time printing of various logs, certificates and statistical data, eliminating the need for log organization and certificate issuance using word processing software.

The electronic sanitation certificate system was constructed in 2004, enabling an international exchange of plant sanitation certificates. Use of this system is limited to re-plant plants and Holland due to system compatibility with other countries. Authenticity of export plant inspection certificates from Taiwan and Australia can be verified with anInternet search. After adopting international standards for exchange of electronic plant sanitation certificates by IPPC in 2014, the efforts to implement this system are expected in each country. South Korea will also play an active role as one of the countries that led the discussion.

4.2.4. Provision of Plant Quarantine Information

Plant quarantine information used to be provided in paper form such as statistical yearbooks. First on-line provision was performed by the Rural Development Agency, which provided an overseas pests database through the Internet. This system allowed for a detailed search for expert information in each field, providing reference information for pests found at quarantine sites. In addition, the Plant Quarantine Station homepage constructed in 1999 provided such information as opening promotions, plant quarantine-related overseas pests, requirements for exported/imported plant quarantine and guidelines for plant quarantine procedures. The exported/imported plant quarantine statistics began to be provided on-line starting from 2003.

The e-mail system was constructed in 2001 to manually send quarantine information to major customers. Adoption of PCR in 2006 enabled management of a customer database, and regular provisions of quarantine information leaflets and newsletters.

4.2.5. Construction of Plant Quarantine Network

Construction of a LAN at main stations and branch stations in 1996 was the first construction of a communication network for data sharing between plant quarantine station personnel. The network connected main stations and branch stations via regular phone lines. Starting from 2001, using the state-constructed ultra-speed information and communication network, a plant quarantine information and communication network was established using the Asynchronous Transfer Mode (ATM) methods. PDA's began to be used in 2005, and a proprietary wireless network was constructed using the KTF network.

Major positions were connected using optic cables in 2006, and the communication infrastructure was completed, capable of providing 2MBps communication speed. In addition, in areas not readily available for communication network construction such as airports, ports CIQ's and dispatched stations, VPN (Virtual Private Network)'s were constructed in 2004 to eliminate communication blind spots. With this, all regions with plant quarantine officers were covered by the plant quarantine information and communication network.

5. Scientification of Quarantine Methods through Adoption of Import Risk Assessment System, etc.

5.1. Animal Quarantine

5.1.1. Background of Quarantine Detection Dogs Adoption

Animals/livestock products import quarantine after the UR emerged in 1986, animal/livestock products import was only allowed from countries without cases of major malignant livestock contagious diseases, to prevent transmission of livestock diseases into South Korea. Although import sanitation conditions for animals and livestock products were enacted and operated, they were mostly operated as common sanitation conditions without specification by country or products.

However, the SPS Agreement made during the UR negotiation (1986~1994) expanded free trade of agricultural products, and this Agreement prevented the animals and plants sanitation regulations in each country from working as a single, uniform non-customs trade restriction.

5.1.2. Change of Systems and Organizations

a. Enactment & Revision of Regulations Related with Import Risk Analysis

Although de-facto risk assessment had been in operation, the legal basis for scientifically justified risk assessment was created somewhat recently by the enactment of the Livestock Disease Prevention Act in 2008. Accordingly, the Instruction on Import Risk Analysis for Import of Designated Quarantine Objects was enacted as the Ministry of Agriculture, Forestry and Fishery Announcement No. 2008-74, which established the legal system that received requests for import permits, initiated import risk analysis, import risk assessment, import risk management and risk information exchange.

b. Reform of Import Risk Assessment Organization

The International Quarantine Department was established in 1990 for collection and management of information on international animal quarantine, international cooperation regarding animal quarantine, enactment of import/export sanitation conditions by each country, comparison and analysis of international animal quarantine systems, and overseas local quarantine on imported quarantine objects.

The International Quarantine Information Department was abolished at the time. However, the Import Risk Assessment Department was set up in 2006, so as to address the people's concerns over safety of imported livestock products, adapt to the period of globalization and internationalization, and prepare a scientific response to the pressure to resume importing US beef, which had been banned due to the bovine spongiform encephalopathy outbreak in 2003.

Subsequently in 2011, when the Veterinary Science and Quarantine Institute, Plant Quarantine Station and Fishery Product Quality Inspection Station were integrated into the Agricultural, Forestry and Fishery Inspection Agency, the Department changed its name to the Risk Assessment Department.The Department expanded its scope of work to include the following: risk/quarantine information collection, analysis and exchange; assessment and analysis on importation ban areas, survey on current status of livestock sanitation and livestock products safety; and international cooperation regarding animals and livestock products.

5.1.3. Methods and Procedures for Import Risk Analysis

a. Overview of Import Risk Analysis

a) Concept

Import risk analysis involves assessing the risks that may be caused by animal/import trade between countries and collecting and assessing information so as to establish appropriate measures to minimize such risks when they exceed the scope tolerable by the importing country.

b) Purpose

Risk analysis on animals and livestock products represent effective disease risk management regarding animals and their byproducts, animal feeds, medical and surgical use, semen, embryo, biological agents and therapeutic substances. Such risks may affect the possibility of disease transmission, settlement and distribution, as well as the people's health, environment and economy. Therefore, most countries perform risk analysis on animals and livestock products to minimize damage to the national economy caused by diseases amid changes in the international trade environment.

b. Methods and Procedures for Verification of Risk Factors

a) Definition

A risk is individually verified by explaining what will go wrong and how it will happen. A hazard produces risk only when a single exposure path exists and exposures produce possibility of negative results. Individual verification of hazards represents the process of individually verifying new causes. Risk sources may discharge risk causes into the air, soil, ground water and underground water. The discharged causes may take chemical, physical, biological or energy forms.

b) Verification of Hazards

(1) Import Risk Assessment should be Preceded by Verification of Hazards

(2) Verification of Hazards

- Hazards verification refers to individually verifying pathogenic agents that might be introduced into South Korea by importation of specific products.
- Pathogenic agents should be individually handled based on scientific data on epidemiological characteristics of the pathogenic agents, including the possibility of presence in the importing country.

- Proceed to import risk assessment performance, if one or more hazards have been verified regarding importation of the designated quarantine objects.
- If hazards are not verified, a part of the import risk analysis procedure may be foregone.

c) Method of Verification

(1) Listing of Potential Hazards

Prepare a list of pathogenic agents related with the relevant designated quarantine objects requested for import permit. The list may contain pathogenic agents with uncertain risk or uncertain ground for exclusion. The list shall be prepared considering the following factors.

- Scientific literature
- Experiences from other countries that experienced risks caused by import path and the relevant designated quarantine objects and designated quarantine objects
- Advice from relevant experts
- Pathogens of animal contagious diseases designated by OIE

(2) Criteria for Import Decision

Whether to designate pathogenic agents as hazards shall be determined by considering the following factors

- Relation with imported designated quarantine objects or transportation methods
- Whether the pathogens do not exist in South Korea but exists in the exporting country
- Whether the pathogens do exist both in South Korea and the exporting country, under the following conditions
  - Pathogenic agents are discovered in South Korea, but with a different strain.
  - Whether the agents may cause a more serious result by interacting with pathogenic agents in South Korea
  - Characteristics of imported designated quarantine objects
  - Distribution of the host of the relevant pathogenic agents in South Korea and in the exporting country
  - Whether detailed risk assessment is required due to limited information on the pathogenic agents

- Whether there are areas where the relevant pathogenic agents did not occur or shows up low in South Korea

- Whether the agent is registered as a pathogen subject by the OIE.

d) Final Confirmation of Hazards

The final hazards shall be confirmed by verifying the characteristics of the relevant pathogenic agent, and the hazard list should then be finalized.

c. Procedures and Method of Import Risk Assessment

a) Procedures of Import Risk Assessment

Import risk assessment consists of four stages: Release Assessment, Exposure Assessment, Consequence Assessment, and Risk Estimation. These stages represent a process for assessing the possibility of hazards being released, settling and transmitting into South Korea through the import of designated quarantine objects, and the biological and economic impact. Both a qualitative method (using terms to express degrees) and quantitative method (using figures to express degrees) are utilized.

b) Method of Import Risk Assessment

(1) Release Assessment

○ Assess the likelihood or probability of hazards being released into South Korea from the exporting country via import path or transportation of designated quarantine objects.

(2) Exposure Assessment

○ Assess the likelihood or probability of animals or people in South Korea being exposed to hazards released into South Korea.

○ If the assessment shows no probability of animals or people in South Korea being exposed to the hazards, risk assessment may be terminated at this stage.

(3) Consequence Assessment

○ This assessment is related to exposures and consequence thereof: specifically, this stage assesses impact on animals or people in South Korea, economic, social and environmental consequences and the likelihood of such impact and consequences.

○ The risk assessment may be terminated at this stage if no potential consequence is verified or no probability is found of such consequences.

(4) Risk Estimation

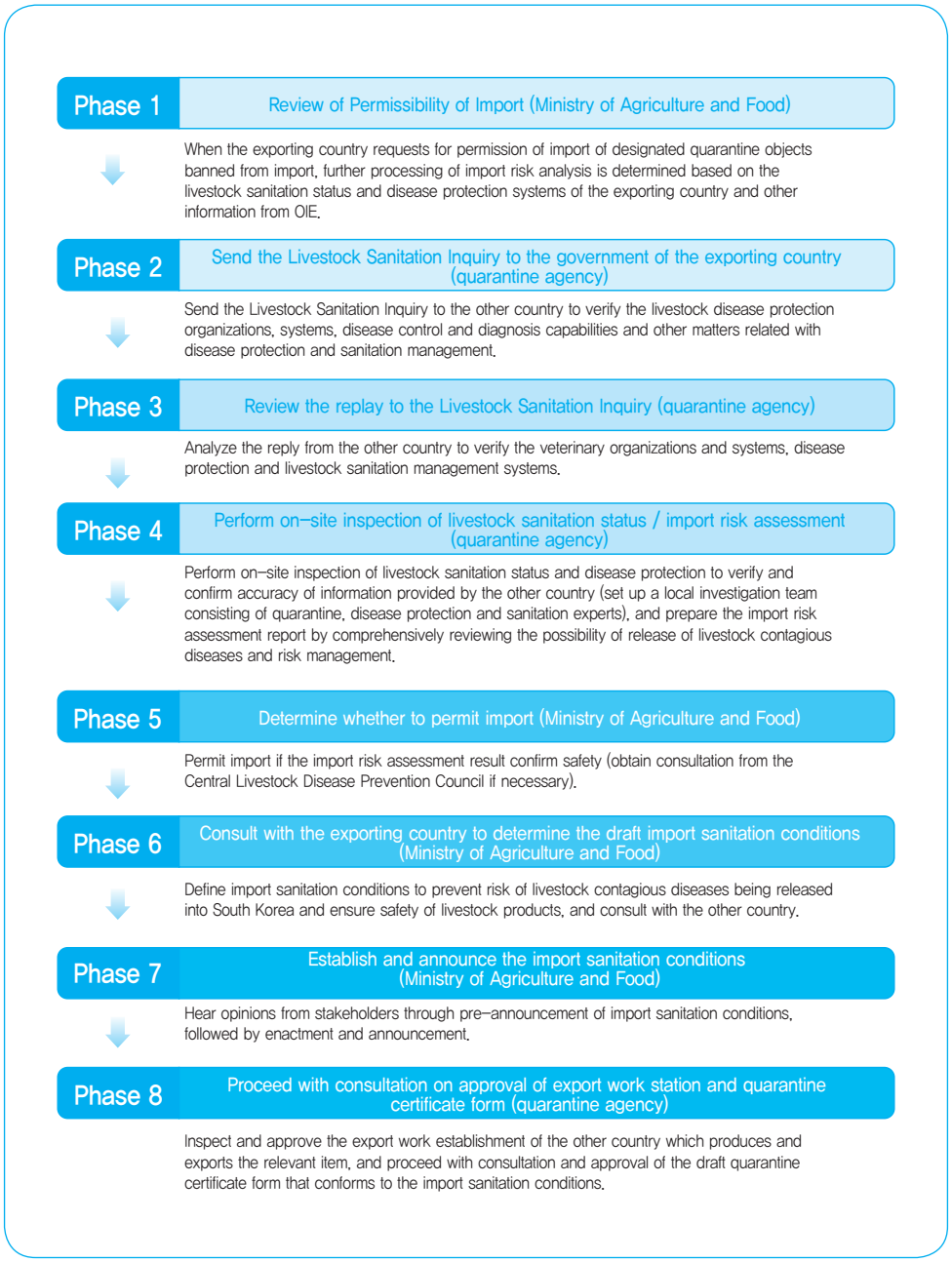
- Results from the release assessment, exposure assessment and consequence assessment are brought together to estimate quantitative or qualitative risks.
- The conclusion must be more than simply the possibility of release, settlement or transmission or potential consequences thereof; likelihood of each factor must be assessed, along with uncertainty and confidence level of such estimations, and hazard verification to unwanted outcomes.

d. Procedures and Method of Import Risk Assessment

In cases where a request for approval of localization is submitted in relation to a certain animal contagious disease, the exporting country must set up the relevant area in compliance with the international standards and submit the evidentiary documents. An import risk assessment may be performed under consideration of the following factors.

- The veterinary authority of the exporting country should define and announce the animal sub-groups within the area as per the international standards, including individual identification and traceability.
- The veterinary authority of the exporting country should provide written descriptions of its organization and sub-organization, including laboratories.
- The veterinary authority of the exporting country should take appropriate measures to protect sanitation of animals in the relevant area: appropriate measures should also be taken for animals and livestock products transported in and outside the area.
- The veterinary authority of the exporting country should prove that it has set up and maintains the relevant area.
- The veterinary authority of the exporting country should perform evaluation of available resources required to setup and maintain the relevant area.
- The veterinary authority of the exporting country should provide services regarding transportation certification, regular inspection on facilities, biological safety measures and monitoring.

Figure 4-19 | Eight Stages of Import Risk Analysis

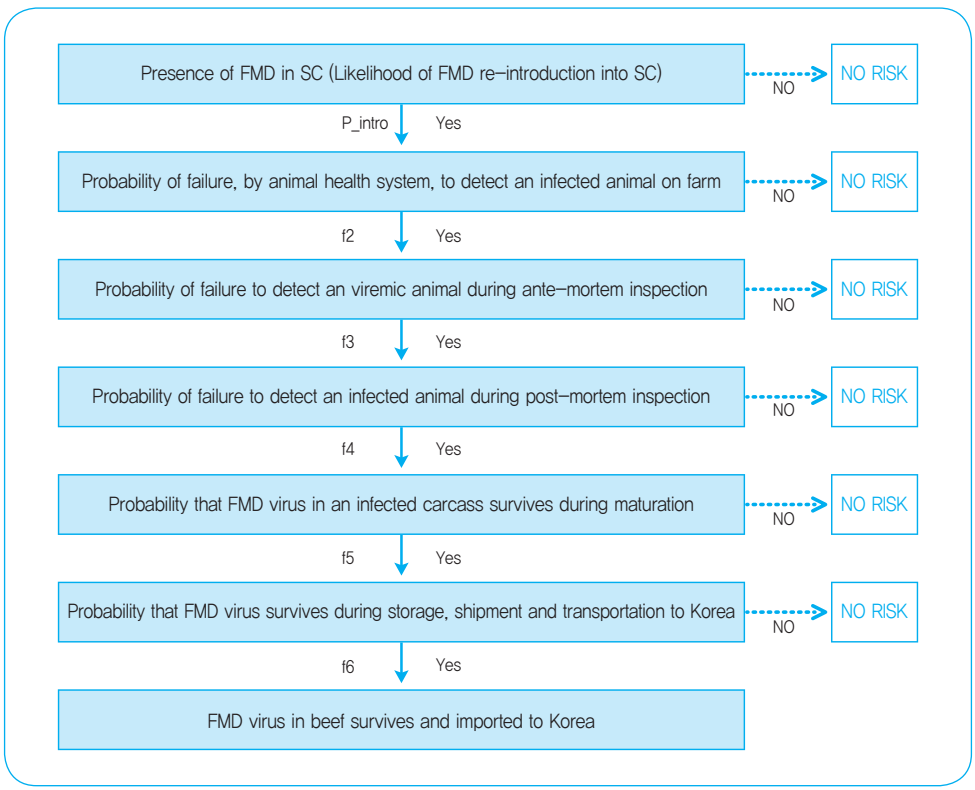


Source: Animal and Plant Quarantine Agency, Quarterly magazine (2013, vol 10).

5.1.4. Development of Import Risk Assessment Model (example: FMD, 2010)

The model was developed as a means of preparing for import permission requests from South American countries recognized as free from FMD by OIE, and using the model as a scientific model to qualitatively and quantitatively assess the possibility of diseases being released into South Korea via livestock products imported from FMD-free areas.

Figure 4-20 | Scenario Path Diagram



Source: National Veterinary Research and Quarantine Service, study on risk assessment for regionalization of FMD related to import risk assessment for beef and pork from Santa Catarina, Brazil.

5.1.5. Outcomes and Evaluation of Import Risk Assessment System

The import risk assessment system was adopted to yielda more scientific response to internationalization and the opening of the domestic market. The key outcomes are as follows.

a. Protection of South Korean Livestock Industry and Reinforcement of Public Hygiene

As mentioned above, the number of trading countries and items vastly increased after the WTO regime. The list of new importing countries and items expanded due to demand of market opening from various countries. However, the Instructions on Import Risk Assessment on Designated Quarantine Objects' made it possible to implement a more scientific and systematic response. This system, after its adoption in 2008, expanded to risk analysis of the overall livestock products hygiene, including HACCP operation and management of residual substances and microorganisms, of 14 products from ten countries, including Canadian beef. This contributed to protecting the people's health by allowing only safe and healthy livestock products to be imported into South Korea. And these efforts created the basis for a more systematic and scientific response to the demand of opening the agricultural/livestock products market, which became a major point of controversy during the FTA negotiations with various countries.

b. Improvement of National Credibility and Prevention of Trade Dispute through Harmonization of Risk Assessment with the International Standards

Adoption of the import risk assessment system ensured transparency by earning the recognition that South Korea employs scientific and reasonable risk assessment based on the WTO/SPS regulations and OIE standards from the international organizations and trading partners. This also contributed to building mutual trust with exporting countries.

There have been some cases of international trade dispute: the United States, Australia and New Zealand brought a case against South Korea to GATT in 1988, in relation to its ban on beef imports and quantity restriction by the latter; in 1999, the United States and Australia brought their cases against South Korea claiming that the latter discriminates against imported beef with its separate sales system; and Canada sued South Korea in 2009 arguing that the latter's ban on imports of Canadian beef does not comply with the relevant international standards. After the adoption of the import risk assessment system, however, there has been no trade dispute cases. This system created the basis for a more systematic and scientific response to the demand of opening the agricultural/livestock products market, which became a major point of controversy during the FTA negotiations with various countries.

5.2. Introduction of Risk Plant Diseases Risk Analysis System

5.2.1. Adoption of Pests Risk Analysis System

Before the enactment of the Plant Protection Act in 1995, pests control was performed on all pests found during quarantine procedures regardless of whether they existed in South Korea. Thus, pests risk analysis did not have much relevance. As the international consensus veered towards the need for scientific grounds for plant quarantine due to the GATT/UR negotiation on agricultural products in the 1990's, the need was generated for a pests risk analysis system.

After the effectuation of the WTO/SSPS Agreement in January 1995, the SPS Agreement and FAO/IPPC Agreement specifically provided for pests risk analysis. According to the outcome of the 28th FAO Conference held in November 1995, pests risk analysis consistedthree phases: initiation, risk assessment and risk management. The initiation phase verifies pests and their pathways. The risk assessment phase assesses whether the pests should be subject to quarantine and whether they are economically significant. The risk management phase develops, evaluates, compares and selects alternatives to reduce the risks. Accordingly, the Plant Protection Act was revised in 1995 to include pests risk analysis, and the Enforcement Decree specified the cases where pests risk analysis should be performed as follows. ① Animals/plants that harm plants ② When determining pests subject to regulation ③ When determining temporary ban on importation ④ When determining or adjusting pests banned from import, importation ban areas or plants ⑤ When permitting limited plant importation ⑥ When determining permission of import of pests for the purpose of creating biological agents ⑦ When determining dispositions for pests subject to regulation/temporary regulation ⑧ pests discovered for the first time during import quarantine procedures ⑨ Certain pests frequently found during import quarantine procedures ⑩ When there is need for determination of scientific criteria.

The pests risk assessment procedure for permission of importing plants previously banned from import has been separately announced, as an eight-stage procedure. Import risk analysis received → Import risk analysis initiated → Preliminary risk assessment → Risk assessment for individual pest → Establish risk management plans → Prepare the draft criteria for exclusion from importation ban → Pre-announce the criteria → Announce and effectuate the criteria. As of the end of 2013, the number of banned items conditionally permitted for importation was 28, from 24 countries.

The specific matters related with quarantine pests are defined by the Enforcement Rules of the Plant Protection Act, and the Rules classify pests subject to quarantine into banned pests and controlled pests during import quarantine procedures. Banned pests refer to those plants with risk of being infected with the relevant pests and are therefore banned from importation under the recognition that those pests will cause serious damage to plants without such measures as disposal or return. Controlled pests are those pests designated by the Minister of Agriculture and Forestry, under the recognition that those pests will cause serious damage to plants without such measures as disinfection. As of the end of 2013, a total of 2092 pests were designated as quarantine pests, of which there are 72 banned pests and 49 controlled pests.

5.2.2. Establishment of Domestic Legal Basis for Pests Risk Assessment

a. Plant Protection Act

Full revision of the Plant Protection Act on January 1, 1995 officially used the term 'pests risk analysis' for the first time. Article 8 of the Act provides that assessment of the level of risks of pests, if pests are introduced into the Republic of Korea from a foreign country, in order to prevent economic losses on agricultural produce and the natural environment, and analyze and assess risks of pests to prepare a scheme for lowering the level of risks (hereinafter referred to as "pests risk analysis").

b. Enforcement Decree of the Plant Protection Act

The Enforcement Decree sets out the following cases where pests risk assessment should be performed.

- In case of determining whether an organism is an invertebrate that harms plants or a harmful plant
- Designating or adjusting regulated pests or non-quarantine pests
- Deciding on a temporary ban on import or release thereof
- Designating or adjusting regions or plants subject to ban on import
- Permitting restricted import of plants through IRA
- Determining whether to permit import of pests for biological disease prevention
- Determining methods of disposal or disinfection of regulated/temporarily regulated pests

- Upon first-time discovery of pests other than regulated/non-quarantine pests through import quarantine
- Certain pests frequently found during import quarantine procedures
- When IRA is deemed required for definition of scientific criteria for quarantine or other purposes

c. The Plant Protection Act

The Enforcement Rule of the Act provides for the following stages of pests risk analysis, to be performed in that order.

① Pests verification investigation on pathway into South Korea, determining whether to proceed with pests risk analysis

② Pests risk assessment,assessing the risk of possible economic and other damages to crops/environment

③ Pests risk management, performing disinfection/disposal/return or import to reduce the risks Select measures to take, including prohibition

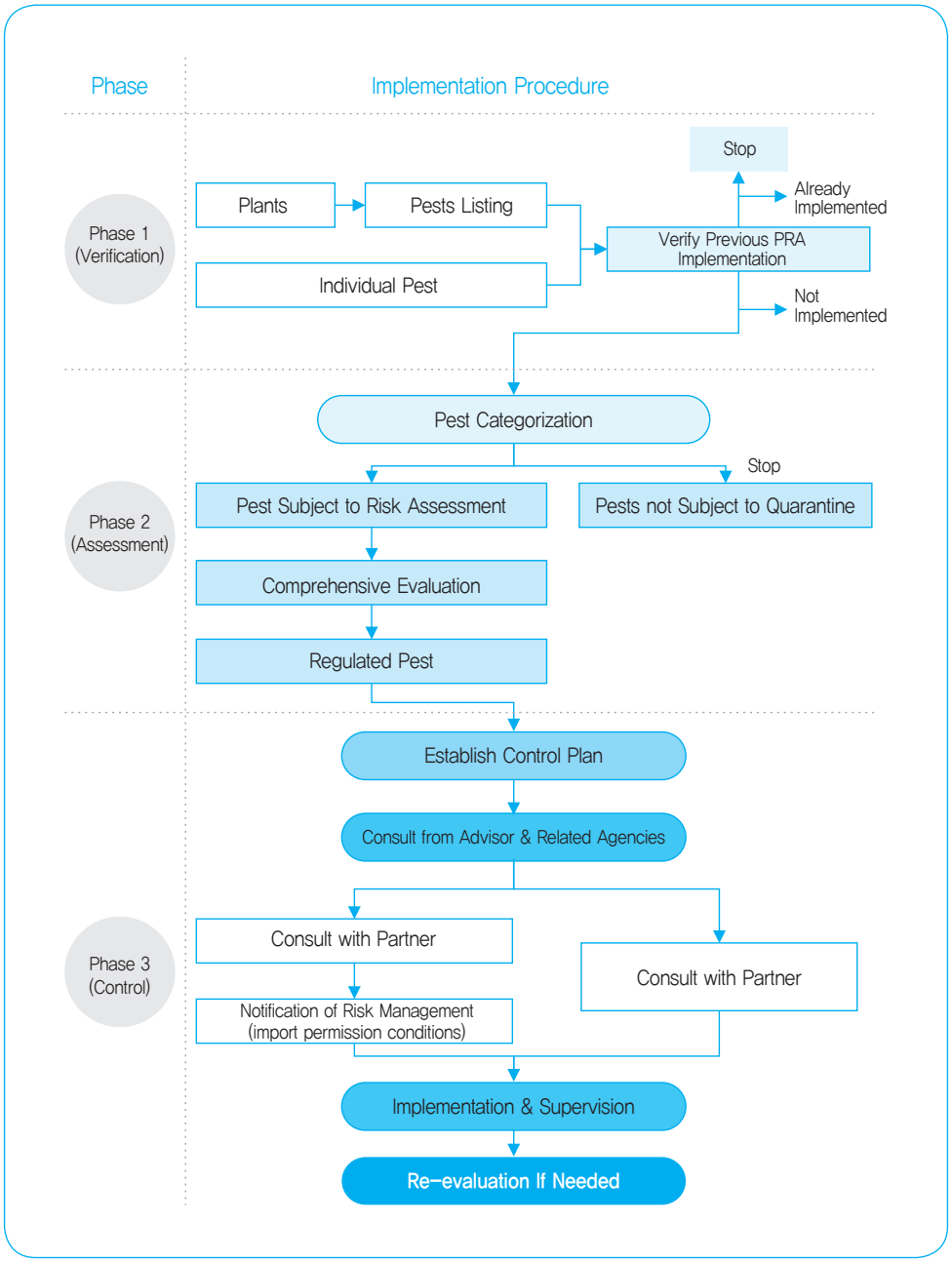
5.2.3. Pest Initiated PRA

Specifics of PRA are defined through announcements from the Plant Quarantine Station, which can be summarized as follows.

a. Pest and Wild Weed Risk Analysis

Pests risk analysis consists of the three phases of initiation, risk assessment and risk management. The initiation phase verifies pests and their pathways. The risk assessment phase assesses whether the pests should be subject to quarantine and whether they are economically significant. The risk management phase develops, evaluates, compares and selects alternatives to reduce the risks.

Figure 4-21 | Diagram of Three-stage Procedure for Diseases/Pests Risk Analysis



Source: Animal and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

b. Risk Assessment for Importation Permission of Importation Ban Plants

Risk analysis on importation ban plants have been divided into eight stages to maintain objectivity and transparency, as it involves various conflicts of interests among stakeholders in and outside South Korea.

① Filing of request of IRA

② Initiation of IRA

③ Preliminary IRA; Pest categorization

④ Pest Risk Assessment

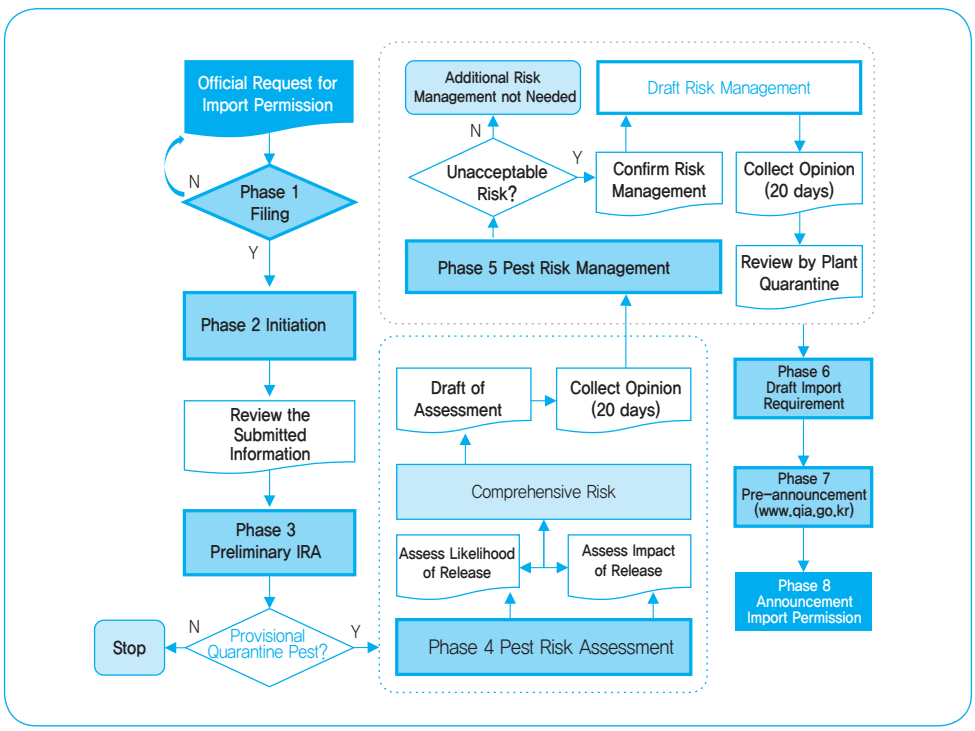
⑤ Pest Risk Management

⑥ Draft of Import Plant Quarantine Requirement

⑦ Post of the Proposed Rule

⑧ Notification and Enforcement

Figure 4-22 | Procedures for Import Risk Analysis (IRA)



Source: Animal and Plant Quarantine Agency, Plant Quarantine Work Manual (2013).

5.2.4. Organizations for PRA

There was no separate organization dedicated to PRA at the time of enacting the Announcement on Pest Risk Analysis in 1996. Pest risk analysis was undertaken by the Pest Investigation Department, and pathogen risk analysis was undertaken by the Pathogen Investigation Department, with the Pest Investigation Department integrating the final management plans. Due to an increase of requests for importation permission of banned plants from exporting countries after the WTO regime, the organization was partially adjusted, resulting in the establishment of the Risk Assessment Department in 2002. The new Department performed monitoring and risk assessment of pests detected during quarantine procedures for imported plants, as well as risk analysis on items subject to importation permission request from the importing countries. However, PRA regarding importation permission was transferred to the International Quarantine Cooperation Department as of March 2003, due to the need to acquire information from the other country on timely basis and consider the overall circumstances of the relevant country. Subsequently, works related with trade issues were mostly completed, and it was judged that transferring the risk assessment back to the Risk Assessment Department would not result in much hindrance in performthe relevant works. Accordingly, starting from 2007, the Risk Assessment Department took over the PRA functions, and the International Quarantine Cooperation Department overtook works related to pest management plans.

5.2.5. Risk Analysis for Pests used for Biological Agents

a. Revision of the Plant Protection Act

Although pests could only be imported for research/experiment purposes with the approval of the Minister of Agriculture and Forestry, there was no criteria for importation of useful organisms, limiting systematic management. The Plant Protection Act was revised in 2002, which allowed those seeking to import pollen vectors or natural enemy insects to request PRA and import the pests depending on the outcome of the analysis.

b. Enactment of the Instructions on Risk Analysis and Import Inspection Methods (2006, Plant Quarantine Station)

After the revision of the Plant Protection Act, the Instructions on Risk Analysis and Import Inspection Methods were announced by the Plant Quarantine Station. The Instructions specified procedures for requesting importation permission, risk analysis and inspection methods, as well as the objects of such requests,only pests used for biological agents, pollen vector, education and exhibition purposes could be imported.

c. Revision of the Plant Protection Act Enforcement Rules (2004)

The revision expanded the scope of pests imported for the purposes designated by the Minister of Agriculture and Forestry to include certain beetles and drosophila for pet/research purposes.

d. Revision of the Instructions on Risk Analysis and Import Inspection Methods (2004, Plant Quarantine Station)

After revising the Enforcement Rules, the Instructions were revised to provide for import inspection on pet insects and insects used for research purposes, while alleviating risk assessment requirements for natural enemies, making it easier to import some internationally certified natural enemies.

e. Revision of the Instructions on Risk Analysis and Import Inspection Methods (2006, Plant Quarantine Station)

The revised instructions provided for the establishment of the 'Risk Assessment Committee for Useful Animals', consisting of experts from the academic sphere and research institutes, to ensure more scientific and objective risk assessment for importation permission. The documents to be provided for importation of useful animals were replaced with animal/plant sanitation certificates issued by public agencies of the exporting country.

6. Enhancement of Quarantine Efficiency through Adoption of Quarantine Detection Dogs, etc.

6.1. Background of Quarantine Detection Dogs Adoption

The announcement of the FMD Epidemiological Investigation Committee that one of the causes of FMD outbreak in 2000 was personally carried in livestock products illegally transported into South Korea by overseas travelers, opening of Incheon International Airport in 2001, and the 2002 World Cup, warranted the need for an effective quarantine method for personal belongings of travelers.

Accordingly, given the recognition that the conventional passive quarantine methods such as promotional materials provided to travelers and voluntary declaration couldnot achieve adequate prevention of animal contagious diseases being released into South Korea, the "quarantine detection dogs system" was adopted as a new quarantine method to achieve active and efficient prevention as well as increase publicity of the ban of personally carried livestock products.

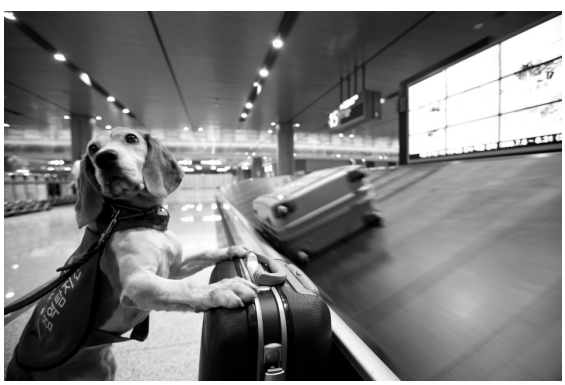
6.2. Progress of Quarantine Detection Dogs Adoption

6.2.1. Initial Adoption and Deploymentto IncheonInternational Airport

Quarantine detection dogs refer to dogs specially trained to detect livestock products by smelling their unique odor. Quarantine detection dogs work with handlers responsible for training and operating the quarantine detection dogs. There are multiple breeds capable of working as detection dogs. However, because the reason the system was adopted was to reinforce the search of personal belongings of travelers, beagles were selected as the breed for quarantine detection in South Korea due to their mild temperament and their affinity to people and strong sense of smell. In addition, their small size helps to alleviate any repulsion or fear felt by travelers.

For successful adoption of the system, a visit to Australia was arranged in 1991, where the quarantine detection dogs system had been in operation since 1991. Subsequently in May 2001, three beagle dogs were purchased from a domestic beagle farm, and one handler was employed on a contract basis as the detection dog operation personnel.

Figure 4-23 | Quarantine Detection Dogs (Beagle)



The progress at the time of first adoption can be summarized as follows.

- 2000.10. On-site investigation performed at the quarantine detection dog training center, raising/maintenance facilities, international airports and post offices in Australia

- 2001.5. Three candidate dogs purchased, and sent to a private training center

- 2001.6. Detection personnel employed (contract position, 1)
- 2001.8. Adaptation training at Incheon Airport CIQ and cargo terminals
- 2001.11.27 Signed the MOU on operation of detection dogs at entry checkpoints in Incheon International Airport
- 2001.11.28 Detection dogs first deployed to the passenger terminal at Incheon Airport
- 2002.2.21 Signed a contract for the design of the quarantine detection dog center
- 2002.3. 6 Handlers employed (17^{th}-grade special position, 18^{th}-grade, 49^{th}-grade positions)
- 2002.7.26 Enacted the Detailed Rules on Operation of Quarantine Detection Dogs (Directive No. 41)
- 2002.9.2 Construction for the Quarantine Detection Dogs Center completed (417.5m^2)
- 2003.9.1 Constructed the Quarantine Detection Dogs Center office and dog shed (sheds, etc. 746m^2, training range 2,179m^2)
- 2005.3.14 Quarantine detection dog permanently stationed at Jeju Branch (Jeju Airport) (1)
- 2006.9.14 Quarantine detection dogs permanently stationed at Busan (Busan Port, Gimhae Airport) (2)
- 2006.8.30 Expanded the Quarantine Detection Dogs Center (management building, dog shed, training buildings and other additional facilities 12,480m^2)

Table 4-20 | Quarantine Detection Dogs Budget Composition in 2002

(Unit: million KRW)

Description	Amount	Note
Detection Dogs Purchase	60	
Training Facilities Installation	521	
Vehicles and Other Expenses	190	
Total	771	

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

Table 4-21 | Organization of the Quarantine Detection Dogs Center in 2002

(Unit: persons)

Position	Personnel	Note
Veterinary, 6th Grade	1	
Special Position, 9th Grade	1	
Special Position, 8th Grade	1	
Special Position, 9th Grade	4	
Total	7	

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

6.2.2. Infrastructure for Operation of Quarantine Detection Dogs

In order to lay the groundwork for successful implementation of the system, and acquire facilities for training and raising dogs, an adequate level of budget and institutional refinement was implemented. Accordingly, the Quarantine Detection Dogs Center was completed in 2002, followed by the construction of office buildings and dog sheds in 2003, and subsequent construction of management building, dog sheds, separation building and indoor training ranges.The Center has now become the comprehensive center for quarantine detection dogs, which covers an area of 12,480m^2.

The Detailed Rules on Operation of Quarantine Detection Dogs (Directive No. 41) was enacted in July 2002 to clearly institutionalize procurement, management, disposal of the quarantine detection dogs and detection objects, methods, as well as training/evaluation of detection dogs. In September 2003, the Enforcement Rules of the Livestock Contagious Disease Prevention Act was revised to provide the legal basis for search activities performed by detection dogs and its handlers, as well as to prepare the required hardware and software.

In addition, in order to ensure stable performance of quarantine objects detection and expansion of facilities and equipments related with detection dogs, a separate budget item for 'Detection Dogs Operation Project' was allocated. In 2002, a total of 771 million KRW was invested for asset procurement and facilities, followed by 809 million investment in 2003. After ten years, as of 2013, the Center is operated with approximately 440 million KRW budget.

Table 4-22 | Budget Investment At the Time of Adoption of Quarantine Detection Dogs

(Unit: million KRW)

Classifications	Investment by Year				
	'02	'03	'04	'05	'06
Detection Dogs Operation	95	218	451	398	426
Expansion of Detection Dogs Center Facilities	521	503	30	0	1,199
Dogs/Equipments Reinforcement	155	88	80	33	25
Total	771	809	561	431	1,650

※ Detection Dogs Operation Expense includes: dog feed, maintenance, public charges, traveling expenses and disinfection agents.

Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

6.2.3. Acquisition of Handler Personnel and Detection Skill Training

Handlers provide an important role of working with detection dogs to search for quarantine objects at the detection sites. In addition, they are responsible for training candidates and managing detection dogs. The number of handlers increased from 2 in 2001 to 6 in 2002, 11 in 2003, 14 in 2004, 16 in 2007 and 18 in 2011. Each handler is dedicated to each detection dog, and deployed to quarantine sites together.

In order to overcome certain limitations, visits were made to quarantine detection dogs sites in the US, Australia and New Zealand to acquire detection techniques and training methods. In addition, experts were invited from overseas to provide know-how that suited the quarantine detection dogs detection circumstances and characteristics of each Airport.

6.3. Present Status of Quarantine Detection Dogs

6.3.1. Quarantine Detection Dogs Personnel and Facilities

The current status of personnel, their location, number of detection dogs and major facilities is as follows.

Fourteen of them are stationed at Incheon Airport Regional Agency, and two personnel are stationed at Yeongnam Regional Agency and Jeju Regional Agency, respectively. The number of quarantine detection dogs was two at the beginning (one of three candidates dropped out due to poor performance), and it grew to 18, where it stands now. The dogs used to be purchased from overseas until 2009. Now, South Korea produces candidate

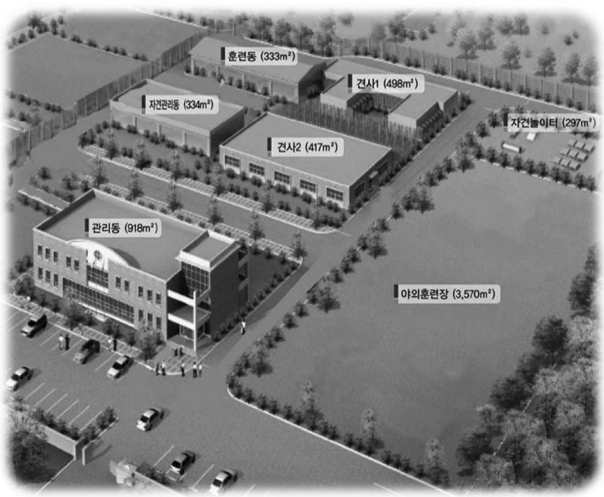
dogs utilizing its own production capability. The Quarantine Detection Dogs Center was established at Incheon Airport Regional Agency in 2002, and has been operating since then. The Center consists of five buildings - management building, sheds, training building, etc. on a site of 12,480m². In addition, small holding facilities were established in Jeju Regional Agency (1,322m²) and Yeongnam Regional Agency (1,317m²) to accommodate the increased number of detection dogs.

Table 4-23 | Quarantine Detection Dogs Facilities by Regional Agency

Classifications		No. of Buildings	Areas (m²)	Main Functions (Facilities)
Incheon Airport	Management Building	1	2.694	Supervision, Public Relations
	Dogs Shed	2	2.0	1 48-room shed, 2 24-room sheds, medical room, kitchen, etc.
	Training Building	1	3.0	Indoor Training Range (conveyor belts, etc.)
	Dogs Management Building	1	334.80	Birth, dogs management, warehouses, etc.
	Outdoor Training Range	-	2.694	Resting space (sunbathing)
	Outdoor Training Range	-	3,570.0	Natural environment, outdoor training, etc.
	Playground	-	2.52	Socialization of candidate dogs
	Others	-	5,787.69	Roads, parking lots, landscape facilities,
	Total	5 buildings	12,480.93	
Jeju	Management Building	1	23.694	Handler office
	Dog Shed	1	53.2	4 rooms (3 sheds, 1 bathroom), dog feed warehouse
	Dog Playground	1	2.0	Resting space (sunbathing)
	Others	-	1,209.06	Dormitory, landscape, parking facilities, etc.
	Total	3 buildings	1,331.2	
Yeongnam	Management Building	1	181	Offices, dog sheds (10 rooms), bathroom, warehouse
	Outdoor Training Range	1	746	10 rooms (detection dogs management)
	Outdoor Training Range		390	Natural environment, outdoor training, etc.
	Total	23 buildings	1,317	

Source: National Veterinary Research & Quarantine Service.

Figure 4-24 | View of the Quarantine Detection Dogs Center at Incheon Airport Regional Agency



Source: National Veterinary Research and Quarantine Service (NVRQS), 'Plan for Animal Quarantine Function Reinforcement and Advancement (phase 4~phase 6).

6.3.2. Evaluation and Outcomes

The quarantine detection dogs system was relatively unknown in South Korea at the time of its adoption, and its success was anything but guaranteed. To overcome this limitation, South Korea has developed the system by acquiring operational techniques and know-how from developed countries with established quarantine detection dog systems. As a result, Japan, China, Taiwan and other surrounding countries are benchmarking South Korea's experience with the system.

6.3.3. Production & Acquisition of Superior Detection Dogs

Quarantine dogs go through multiple stages of training and evaluation to acquire the required capabilities. Only a small number of dogs pass these stages and become quarantine detection dogs, which is a process that requires much time and energy. To overcome this limitation, South Korea has been developing an advanced technology to breed dogs with a certain level of detection capabilities from the detection dogs with exceptional detection capabilities, using the state-of-art technology, cloning. Using this cloning technology, the

time required for training after birth is reduced from the current 18 months to 10, enabling early deployment into the quarantine sites. In South Korea, 14 cloned dogs have been produced at Seoul National University, and another four at the National Institute of Animal Science. Five of them have been deployed to the quarantine sites, and the other 13 dogs have completed their training.

Figure 4-25 | Cloned Quarantine Detection Dog

Source: Animal and Plant Quarantine and Inspection Agency (QIA) press release 2014.

6.4. Outcome of Quarantine Detection Dogs Adoption

6.4.1. Increased Detection Rate

One of the major pathways for overseas livestock contagious diseases into South Korea is overseas livestock products illegally being carried into South Korea by travelers from overseas. Promotion and detection activities have been performed in 16 ports and airports to prevent such risks. However, these activities relied on passive methods such as inquiry and visual inspection and voluntary declaration. Insufficient workforce, organization and facilities were ineffective in preventing illegal livestock products from being introduced into South Korea.

The detection dogs system was adopted as a new detection method for the purpose of overcoming the above potential risk factors, and the system has earned excellent results at the quarantine sites. As can be seen from the table, the number of detections by quarantine

detection dogs is on the rise despite a drastic increase of carry-on items subject to quarantine after 2008, which proves the much improved efficiency of the quarantine detection dogs system.

Table 4-24 | Changes in Result of the Quarantine Detection Dogs System

Classifications	'02	'08	'10	'12	Note
Total Cases of Detected (A)	5,696	37,603	49,965	49,156	
Cases Detected by Detection Dogs (B)	1,862	12,509	17,927	22,399	
Ratio B/A (%)	32.7	33.2	35.9	2.6	

Source: National Veterinary Research & Quarantine Service.

6.4.2. Establishment of Active Quarantine system

The detection system for personally carried livestock products at ports or airports relied on X-ray tests or searches of personal belongings, or passive quarantine methods designed to encourage voluntary declaration from the travelers themselves. Even in cases where reinforced border quarantine is in dire need, such emergency measures consisted of passive measures that relied on other agencies, such as the cooperation of relevant agencies and publicity of border quarantine, which prevented meaningful results at the quarantine agency from being achieved. Adoption of the quarantine detection dogs system, however, provided the momentum for conversion into a quarantine system capable of taking active measures, by deploying detection dogs into risky lines or lines where contagious disease occurrences were detected.

6.4.3. Publicity of Border Quarantine

Quarantine detection dogs contributed to directly detecting unreported or hidden livestock products, as well as to raising people's awareness on voluntary reporting and why they should not carry livestock products from overseas. Also, TV and media coverage of detection dogs have publicized the significance of border quarantine while elevating the status of quarantine agencies.

7. International Cooperation

7.1. Animal Quarantine

A nation's animal quarantine policy represents regulatory measures to protect the people and livestock industry from hazards that can be released from overseas. Conflicts may arise with the other country surrounding the criteria and result of such quarantine processes, and these conflicts are increasing due to the expansion of free trade and the increase of trade volumes. South Korea has traditionally been a country that relied on imported livestock products, and the quarantine process for animals/livestock products has surfaced as the core of trade issues with other countries. To prevent such conflicts and ensure the safety of imported animals/livestock products, South Korea as adopted international standards that specify quarantine inspection methods and procedures, and provide active opinions for establishing those standards. South Korea has also implemented other efforts for internationalization of quarantine regulations. In addition, it has established a system for collecting information from overseas to ensure speedy investigation/analysis of overseas quarantine inspection systems and acquisition of information on actions taken by countries where livestock contagious diseases have broken out.

7.1.1. Cooperation with International Organizations

The single most important international organization in the field of animal/livestock product quarantine is WOAH (World Organization for Animal Health, OIE). South Korea became a member in November 1953, and has been actively participating in general meetings every year since then. In 1983 and 2005, South Korea hosted the 12th and 24th Asia-Pacific Regional Committee Meetings, respectively. South Korean experts are participating in the ad hoc group on biotechnology and the brucellosis and pneumonia expert council, and the position of the Vice Chairman of the Science Committee is held by a South Korean expert. South Korea has also acquired and operated WOAH Reference Labs for five diseases in 2009, and provided support for technological diagnosis for other countries in the region such as Mongolia.

In addition, South Korea sent experts or participated in WHO, CODEX and WTO, contributing to furthering international cooperation.

7.1.2. Bilateral Cooperation

Acceleration of disease transmission and increase of animal/livestock products trade volume has generated a dire need for bilateral cooperation. Accordingly, after the establishment of the animal quarantine system in 1996, South Korea began to expand exchanges with other countries by signing MOU's for technology exchange with overseas quarantine agencies.

These efforts resulted in MOU's for cooperation regarding animal quarantine inspection with Chile and Uruguay in 2006, Poland and Argentina in 2007, and Australia and Hungary in 2008. Thus, South Korea has been consolidating bilateral cooperation by cooperating on current issues among the countries.In 2014, a MOU for general animal and plant quarantine was also signed with AQSIQ, China.

7.1.3. Miscellaneous

In addition, South Korea has been helping establish infrastructures for animal diseases and animal quarantine in the surrounding countries through KOICA projects. The country began seminars on livestock product safety management as a part of the ASEAN Cooperation Project for Livestock Sanitation and Safety.

7.2. Plant Quarantine

7.2.1. International Organizations

a. WTO/SPS Conference

South Korea has been participating in WTO/SPS meetings since the effectuation of the SPS Agreement in 1995. The Ministry of Agriculture, Fishery and Rural Affairs, animal and plant quarantine experts, the Ministry of Health and Welfare, the Food and Drug Administration and the Ministry of Ocean and Fisheries formed a delegation for conferences held every three years. Also, to maintain cooperation with agriculture officials working for the South Korean delegation in Geneva, and to ensure efficient participation in the conferences, the relevant agencies hold preliminary meetings to prepare for the conferences. Recent conferences have been used as a forum for active consultation on current bilateral issues, thereby preventing disputes related with quarantine of agricultural products

b. International Plant Protection Convention (IPPC)

IPPC, which defines international standards for plant sanitation and provides assistance for performance thereof, is one of the most important international organizations in terms of plant quarantine. It had 181 member states as of 2014. IPPC is the only international

organization that defines international standards related to plant sanitation, and it is a sister organization of SPS. South Korea joined IPPC in 1995, but its contribution has been insignificant. After the emergence of the WTO/SPS, the country began to more actively participate in IPPC conferences. South Korea began to be actively involved with expert working groups, such as those groups for regulated/non-quarantine pests, plant sanitation certificates, plants as quarantine pests, local quarantine, seeds, used machines and marine containers. The number of South Korean participants was only one at first, but delegations consisting of 3~4 members began to participate in the conferences starting from the mid 2000's, allowing for active involvement in various activities during the conference period.

In particular, South Korea has been elected the Chair representing Asia. A South Korean delegate was elected as the Head of the Financial Committee in 2012, and as the IPPC Chairman for the first time among Asian countries. South Korea could consolidate its status as the leader of Asia and have one of its delegates be elected the Chairman only after ten years of active participation. This achievement was based on the country's efforts to train experts, provide them with opportunities to attend the conferences, voluntarily provide contributions, hold IPPC meetings, and assist in the participation of developing countries.

c. Asia-Pacific Plant Protection Committee

The Asia-Pacific Plant Protection Convention was adopted in 1956. South Korea joined the convention in 1981, and the Rural Development Administration hosted the 1989 APPPC General Meeting. APPPC has three permanent committees: Plant Quarantine Committee, Pesticide Committee, and Integrated Pest Management (IPM) Committee. Of the three, the Plant Quarantine Committee has been the most active. In 2013, the 26th General Meeting was held by the Animal and Plant Quarantine Agency in Jeju-do. South Korea is the APPPC Chair, its term ending in 2015. Also, South Korean experts are working as the leader of the Working Group for Implementation of International Standards for Plant Sanitation, and a member of the Plant Quarantine Local Criteria Committee.

7.2.2. Bilateral Cooperation

As requests for ban on import of agricultural products increased starting from the late 1980's, South Korea has been actively responding to such requests by holding bilateral plant quarantine meetings with its trading partners. Korea-US plant quarantine meetings were first agreed upon in 1989, and held once a year starting from 1990. Korea-US plant quarantine meetings, Korea-Australia plant quarantine meetings and Korea-Vietnam plant quarantine meetings have been held once per year, starting from 1999, 1995 and 2005, respectively. Recently, regular meetings are being held with China.

Apart from these regular meetings, meetings for technology cooperation with Taiwan, Holland, Canada, Chile, and other countries are held when needed. Through these bilateral talks, South Korea permitted the import of 28 items (44 cases) from 24 countries, and negotiation is underway for 64 items (160 cases) from 39 countries. Also, South Korea agreed on the export of its agricultural products (54 items, 130 cases) to 15 countries, and negotiation is under way for the export of 44 items (98 cases) with 19 countries.

7.2.3. Technological Support for Developing Countries

a. Local Workshops on the Draft of Plant Quarantine International Standards

The WTO/SPS Agreement requires each state to have plant quarantine measures be compliant with the relevant international standards. FAO/IPPC, the organization responsible for setting up international standards related with plant quarantine, annually adopts and revises around five standards. In order to promote understanding of international standards as well as participation from the member states, developing countries, in particular, before adopting such standards, the IPPC encourages the member states to hold regional workshops sponsored by developed countries to lessen the financial burden of the IPPC. South Korea complied by holding workshops for Asian countries and providing travel expenses for participants from developed countries with a budget separately secured for this purpose from 2006. These workshops serve as a venue to discuss draft international standards to be adopted the following year or the year after, and as an opportunity to reach consensus on the collective opinions of the Asia region, and submit those opinions to the consensus process.

The workshops in Asia have been held with the highest level of stability, owing to the constant support from South Korea, and they have set an example for other regions in terms of workshop organization and contents. Even the IPPC Secretariat expressed interest in applying them to other regions. This workshop project has been recognized and reported as one of the most stable and effective supports within the IPPC at each annual meeting. Since the workshops are held in South Korea, many employees have the opportunity to go into sessions on various topics to have South Korea's positions reflected, and provide the employees with experiences of international conferences. The workshops have been held in a variety of locations, so as to offer visits to the field to introduce South Korea's plant quarantine systems, and improve the recognition by other countries of South Korea's agricultural products and quarantine systems by having them visit its research facilities, orchards, farms and fruit selection stations and distribution centers.

b. Training for Plant Quarantine Experts from Developing Countries

The training project began as a follow-up action after the Korea-ASEAN Summit, when a training project for quarantine technology sharing was proposed at the 5th ASEAN+3 Agricultural Minister Meeting in 2005. The project has been in operation since 2006 when the first project began. The scope of participation expanded from ASEAN countries to other developing countries. While the early projects focused on lectures on South Korean quarantine system, site visits and practical exercises, the more recent ones have held workshops or symposia related with IPPC or APPPC projects, or mini-workshops on specific areas for three to four days during the training period, and other programs needed by the participating countries.

South Korea hosted the APPPC Pests Outbreak and Extermination Workshop in 2010 to facilitate participation of developing countries, including ASEAN countries. A mini-workshop on separation identification of mycete was held in 2011, followed by a joint global symposium between APPPC and IPPC on pest monitoring in 2012. In 2013, South Korea invited an ex-director of bio security, who wrote the market access manual for IPPC, for a mini workshop using the manual as the textbook. In 2014, a mini workshop was held with a staff member from the IPPC Secretariat, using the 'IPPC Conference Participation' manual as the textbook.

Such training projects not only represent the opportunity to introduce South Korea's plant quarantine systems to plant quarantine officers from developing countries while familiarizing them with Korean culture and cuisine, but also the means of assisting projects implemented by international organizations. Thus, the projects have been positively regarded by participating countries and international organizations. In addition, South Korean staffs have participated as lecturers or guides, providing them with the opportunity to build their international capabilities. Surveys are conducted on participants and plant quarantine agencies in other countries to identify the needs of the participating countries and reflected in designing future programs each year.

c. Assistance with Border Quarantine System Construction in Developing Countries

As those countries that participated in South Korea's plant quarantine system workshops on international standards and plant quarantine expert training began to individually request more specific assistance focusing on technology transfer, South Korea allocated a separate budget for providing assistance to those individual countries in 2011. Laos was selected as the first beneficiary. A MOU was signed for the provision of training of plant quarantine officers in Laos, quarantine equipments, and local training by South Korean experts, for a period of three years.

Under the MOU, five to six plant quarantine officers were invited to South Korea every year for practice sessions focusing on on-site quarantine. South Korea also provided lab equipments and books, and dispatched pest experts to Laos to assist with construction of labs suited to the local circumstances and teach separation identification.

Although this project is relatively small with an annual budget of 50~60 million KRW, it has been recognized as a highly significant and effective project where plant quarantine officers on the field participate. South Korea is continuing with the effort to provide localized training to meet the specific circumstances in Laos, by identifying their needs every year. Upon request from Laos, the local training will be provided after the end of the project in 2014, although in a reduced scale. The same type of project will be implemented for Myanmar starting from 2014.

Chapter 5

Factors Behind Success of Early Advancement of Animal and Plant Quarantine and its Limitations

Factors Behind Success of Early Advancement of Animal and Plant Quarantine and its Limitations

1. Factors Behind Success of Early Advancement

1.1. Establishment and Continuous Implementation of Systematic Mid/Long-term Plans

Establishment of systematic mid/long-term plans and the will of the government to continue with implementation of the plans are one of the factors that led to the early advancement of South Korea's quarantine infrastructure. The early advancement was made possible by comprehensive quarantine national plans for quarantine reinforcement and government-wide efforts to select and implement various projects for each phase.

In 1993, before the creation of the WTO and the effectuation of the WTO/SPS agreement, the government predicted the possible impact of the UR regime on South Korean agriculture, and established a comprehensive plan to prepare for the UR regime. Thus, the Five-year Plan for New Agricultural Administration was established in 1993. Subsequently, after an in-depth review on changes and possible plans for the animal and plant quarantine field, the government established the first Five-year Plan for Animal and Plant Quarantine Reinforcement. That is, the Five-year Plan for New Agricultural Administration proposed the central direction for mid/long-term development of quarantine infrastructure, and motivated the government to accomplish the goals.

1.2. Awareness-raising and Foundation of Legal Basis for Harmonization with International Standards

The national consensus for revision of the systems and laws in compliance with the SPS Agreement was a factor that led to the success of the enactment/revision of the relevant systems and laws.

As for Animal Quarantine, the Livestock Diseases Prevention Act was revised in 2008 to conduct import risk analysis on the possibility of a contagious disease outbreak caused by the import of quarantined products, and risk assessment models for FMD-free areas, FMD vaccination-free countries and Highly Pathogenic Avian Influenza were developed and applied in 2010, which contributed to resolving conflicts with exporting countries and gaining the of the international society. These models need to be diversified and expanded for each product, country and importation paths.

As for plant quarantine, the Plant Protection Act was revised in 1995 for harmonization with the international standards. Before revision of the Plant Protection Act in 1995, pests control was performed on all pests found during quarantine procedures. However, in keeping with the international standards that prohibited quarantine measures for pests in the importing countries, a new system was adopted to designate pests subject to quarantine on a scientific basis and take quarantine measures and risk analysis. In addition, other implementable procedures were specified by announcements from the Plant Quarantine Station, regarding the equivalency issue under the SPS Agreement, risk assessment, implementation of SPS regulations, and ensuring clarity.

1.3. Change of Attitudes and Formation of Social Consensus on Quarantine

Raised interest and awareness on quarantine and the social consensus for the need of a stronger and scientific quarantine system was another factor that led to continued development of the quarantine infrastructure.

Major events such as the quarantine works for the Asian Games in 1986 and Seoul Olympic Games in 1988, detection of 0157:H7 from US beef in 1997, detection of dioxin from livestock products from Belgium in 1999, led to increased awareness of the safety issues with imported agricultural products, which justified the need to establish a strong quarantine system to protect the people's health. Other incidents such as BSE in US beef in 2003, detection of steel power from US powdered milk in 2006, melamine contamination of

Chinese powdered milk in 2008, and FMD and HPAI outbreaks, led to the social consensus for quarantine measures, and resulted in the national support for expanding financial investment in advancing the quarantine infrastructure.

In addition, the awareness of the dire need for plant quarantine expanded due to the death of South Korean pine trees and nut pine trees by *Bursaphelenchus xylophilus*, the massive cost of prevention thereof, inconveniences generated by the ban on transportation, and social concern on occurrences of new pests such as *lycorma delicatula* and American planthopper. The social awareness of solving the issue of plant hygiene requirements was raised as the focus of relevant policies shifted to expanding exports of South Korean agricultural products.This raised awareness that helped form the consensus for investment and competency building in the field of plant quarantine.

1.4. Early Securing of International-level Quarantine Expertise through Reinforced Education & Training

In terms of personnel training and education, reinforcement of the expertise of quarantine inspection personnel led to the success of early advancement. Efficacy of quarantine measures depends on the acquisition of expert personnel with the appropriate expertise and analytic skills. Although it would not be difficult to acquire expert personnel who majored in the relevant fields at universities, thorough preparation for market opening depends on how much quarantine capabilities of global standards can be secured in a short time.

Emergence of the UR regime (1986) and the effectuation of the SPS Agreement (1995) generated the need for training of experts in various fields ranging from administrative organization, international cooperation (commerce) and precision inspection system. In order to acquire the needed technologies, employees of quarantine agencies were dispatched to overseas research institutes as a part of the Animal Quarantine Function Reinforcement Project that starting from 1992 and continues till this day.

During early expansion of free trade in late 1995, the government implemented efforts for training of experts in various fields ranging from administrative organization, international cooperation (commerce) and precision inspection system. Short/long-term training at advanced research institutes in each field located in the US, France, Canada and the UK continued, which contributed to improving the level of the quarantine system in South Korea in a relatively short time.

After the 2000's, after it was deemed that the quarantine expertise in South Korea reached a certain level, employees were being sent in the form of long-term dispatches to international organizations (OIE, FAO) to help acquire animal quarantine information and enhance international cooperation.

Another major factor for early acquisition of quarantine site expertise was shifting the focus of personnel training based on the recognition of the importance of rapid collection of disease information, cooperation with relevant agencies, and close cooperation with trading partner countries.

1.5. Expansion of Financial Investment for Improving Work Efficiency Regarding Information, Computerization and Detection Dogs

In terms of information technology, the early opening of the quarantine information system (1995) and transition to the advanced computer systems were achieved through the superior Internet environment of South Korea and its computerization technologies. KAQIS simplified the administrative procedures for the greatly increased number of quarantine objects, enhanced work efficiency, and established a basis for providing high-quality services to the people. Computerization of the plant quarantine information was advanced starting from 1996: a system capable of on-site processing of quarantine works was constructed utilizing the PDA system. South Korea's IT capabilities are expected to play important roles in advancing the quarantine system, deriving statistical data from big data accumulated over the years, and prediction of quarantine outcomes as well as improving inspection accuracy.

Adoption of the quarantine detection dogs system enhanced precision and efficacy of quarantine inspection on personally carried, illegal agricultural products, which were largely neglected by the quarantine system. One of the major pathways for overseas livestock contagious diseases into South Korea is overseas livestock products illegally being carried into South Korea by travelers from overseas. Promotion and detection activities were performed in 16 ports and airports to prevent such risks. However, these activities relied on passive methods such as inquiry and visual inspection and voluntary declaration. Insufficient workforce, organization and facilities prevented the effective prevention of introducing illegal livestock products into South Korea. To overcome these potential risk factors, the detection dogs system was adopted as an innovative way to effectively search for livestock products using the dog's keen sense of smell without causing repulsion from the travelers. This system has achieved superior results at the quarantine sites. The detection

dogs were responsible for 1,862 or 32.7% of the 5,696 cases of livestock products detection in 2002. After ten years, in 2012, detection dogs were responsible for 22,399 detections out of a total of 49,156, which show a substantial increase in their detection output.

The quarantine detection dogs system was relatively unknown in South Korea at the time of its adoption, and its success was anything but guaranteed. To overcome this limitation, South Korea had developed the system by acquiring operation techniques and know-how from developed countries with established quarantine detection dog systems. As a result, Japan, China, Taiwan and other surrounding countries are benchmarking South Korea's experience with the system. In March 2014, South Korea signed an MOU with AQSIQ, China, for reinforcing technological exchange between the two countries regarding the quarantine detection dogs systems in each country. This is a testament to the current level of South Korea's capability of operating quarantine detection dogs.

2. Limitations and Solutions

2.1. Emergence of New Diseases

As the South Korean climate changes to a sub-tropical climate, new animal diseases such as West Nile Fever, Hendra Virus, Schmalenbach, Nipah Virus, and new plant diseases such as *Bactrocera tryoni*, *Citrus greening* and *Candidatus Liberibacter solanacearum* emerged, increasing the likelihood of their introduction into South Korea. Emergence and transmission of these diseases and pests cannot be attributed to a single cause. However, climate change, population flow, increased volume of agricultural/livestock products trade are identified as causes for transmission of these new diseases.

Many of these diseases are transmitted via pathogens transmitted to human hosts, and the number of animal-human transmission cases is increasing at an alarming rate, drawing much attention from the public health and veterinary fields. Another characteristic of the transmission is that diseases that used to be confined to certain areas are rapidly proliferating into new areas.

In early 2014, *Bactrocera tryoni* was found for the first time in Riverland, Australia, to which the Australian authority performed emergency protection and eradication. *Bactrocera tryoni* usually exist in areas with agricultural products imported into South Korea (mango, orange, sweet cherry, etc.). If released into Korea, they are highly likely to settle in the country. This will lead to massive damage to the South Korean fruit industry. Also, in June 2014, *citrus greening* broke out across Mexico, and South Korea banned importation of

fruits produced in the affected areas. Citrus greening typically spread via tangerine trees as their host plants, one of the main fruit crops in South Korea. Their introduction would have massive economical impact. In addition, *Candidatus Liberbacter solanacearum* broke out in the US and New Zealand, and South Korea added it to the banned disease list in 2013 toprevent its introduction.

South Korea has established a system for verifying and interdicting new diseases and pests such as West Nile Fever, Nipah Virus and sub-tropical *Bactrocera tryoni*, for example through demanding non-occurrence certificates or performing verification inspections during importation. However, for more thorough interdiction, a new quarantine system needs to be developed to prevent the intrusion of new pests and block and verify them at the border, upon acquisition of the occurrence information from overseas.

2.2. Limitations in Preventing Intrusion of Diseases and Pests from Surrounding Countries

It is virtually impossible to stop pests from moving into other areas all together. There is always the possibility of pests being transmitted to the adjacent areas through environmental changes, geographical situations, flow of river and ocean, wind and movement of migratory birds. Such transmission cannot be accurately predicted, thereby producing the limitation on stopping pests from moving into other areas all together.

Outbreak of livestock contagious diseases in surrounding countries will increase the possibility of intrusion into South Korea. Due to an increased personnel and physical exchange caused by increased trade and overseas travel, the pests from surrounding countries represent a threat in terms of quarantine.

Of the 73 countries with FMD occurrence, 32 are Asian countries, with Asian countries accounting for 16 of the 22 countries where HPAI broke out. Since mutual exchange within Asia is increasing due to such factors as the introduction of new direct flight routes, physical distance alone cannot be expected to guarantee safety.

This warrants the need for a system capable of continuously monitoring disease occurrences in adjacent countries and trading partners, and transmitting the information to the quarantine sites in real-time. More investment needs to be made in expanding information to achieve monitoring, accumulation and interpretation of acquired information and utilization of big data. Another alternative is to secure a system for intra-organization communication for real-time sharing of information with the border quarantine systems and monitoring/protection systems.

Table 5-1 | Countries with FMD and HPAI Occurrence (as of June 2014)

Diseases	Continent	Country
FMD (73 countries)	Asia (32 countries)	Nepal, Taiwan, Laos, Lebanon, Malaysia, Mongolia, Myanmar, Bangladesh, Bhutan, North Korea, Vietnam, Saudi Arabia, Sri Lanka, Afghanistan, Oman, Iraq, Iran, Israel, India, Yemen, China, Kazakhstan, Qatar, Cambodia, Kuwait, Kirghiz, Tadzhikistan, Turkey, Thailand, Pakistan, Palestine, Hong Kong
	Africa (37 countries)	Ghana, Guinea, Namibia, South Africa, Nigeria, Niger, Rwanda, Libya, Malawi, Mali, Mozambique, Bahrain, Botswana, Burundi, Burkina Faso, Benin, Somalia, Sudan, Senegal, Angola, Egypt, Uganda, Eritrea, Ethiopia, Zimbabwe, Zambia, Central Africa, Chad, Congo, Comoros, Côte d'Ivoire, Kenya, Cameron, Tanzania, Togo, Tunisia, Equatorial Guinea
	Europe (1 country)	Russia
	America (3 countries)	Venezuela, Ecuador, Paraguay
HPAI (22 countries)	Asia (16 countries)	Nepal, Taiwan, Laos, Myanmar, Bangladesh, Bhutan, North Korea, Vietnam, Iran, Israel, India, Indonesia, Japan, China, Cambodia, Hong Kong
	Africa (3 contries)	South Africa, Egypt Libya
	Europe (1 country)	Italia
	America (1 country)	Mexico
	Oceania (1 country)	Australia

Source: National Veterinary Research & Quarantine Service.

Currently, inspections are conducted on samples in most cases. Therefore, we cannot rule out the possibility of banned pests being released into South Korea. Since inspection of all items is not economical, not to mention difficult to implement, the products are sampled based on statistically proven methods to maximize the efficacy of the inspections. These statistical approaches, however, does not prevent introduction of diseases and pests all together.

Therefore, the quarantine authority should implement post-quarantine measures to prevent settlement of pests from overseas. Ensuring of the efficacy of border quarantine requires well-organized continuous pests monitoring and prevention, and a system for sharing relevant information with the border quarantine system. As animal quarantine and border quarantine are overtaken by a single organization, there is no issue with information sharing and cooperation. As for plant quarantine however, border quarantine (Plant Quarantine Division) is organizationally separated from monitoring and protection functions (Rural Development Agency), which is why it is imperative to implement personnel and technological exchange between the two. One alternative would be integrating the two organizations and functions, thereby overcoming limitations in plant quarantine.

2.3. Diversification of Quarantine Level Requirements between Trading Countries

Requirement from stakeholders has also been diversified. While the demands in the past were for reinforcement of border quarantine so as to prevent introduction of overseas livestock contagious diseases into South Korea, the current demands are for maintaining the disease-free country status and thereby expand export of the relevant livestock products. Also, in terms of quarantine techniques, since livestock contagious diseases are characterized by fast transmission that make it difficult to control them, consumer groups and the National Assembly are demanding the reinforcement of preemptive safety measures at the exporting countries to ensure the animals/livestock products are exported in a safe state.

An increase in income has led to new markets for fruits, vegetables, replanting plants and flowers from overseas and an increase of domestic demand for such products. This trend was accompanied by an elevating pressure from other countries to open up the South Korean agricultural market. Especially, South Korea has been receiving an increasing number of import requests for those fruits previously banned from import into South Korea that are only importable after agreeing on import sanitation conditions through risk assessment. As a result, 104 risk assessments for 65 items from 40 countries are being processed as of 2014. Requests for expedition of the IRA process are frequently made through bilateral conferences, and multilateral conferences such as the WTO/SPS and FTA agreements.

Stakeholders in South Korea also seek to export various plants to multiple countries. This requires strengthening international cooperation regarding identification of/consultation on requirements of plant quarantine for import. As China and South Asian countries, the new markets for South Korea's major agricultural products, have come to have plant quarantine

capabilities, these countries tend to request more reinforced plant sanitation conditions compared with the past. China and Vietnam ban imports of agricultural products that have not been imported before, only allowing imports after conducting plant pest risk assessment and agreeing on the plant sanitation conditions. This policy has led to more active negotiation with these countries through bilateral conferences. Furthermore, the countries sometimes conduct pest risk assessment on products that used to be traded without such assessment, which calls for a higher level of negotiation capabilities on the part of South Korea. South Korea has been involved in export negotiations with 20 countries regarding 47 items as of 2014.

Although importation ban areas and approval for overseas work establishments and import sanitation conditions have operated to preemptively secure safety, these requirements can be interpreted as demanding reinforcement of the system's efficiency and substantive consolidation thereof, as introduction of livestock contagious diseases lead to massive damages and losses.

In addition, the increase of delivery using small-sized packages due to active Internet transactions represents another threat for border quarantine. Some cases involve live animals, which should be subject to quarantine measures before entry, being delivered via express delivery, which warrants the need for an approach distinguished from the past. It is time to develop new quarantine systems capable of handling quarantine works targeting small packages, for example by expanding the use of detection dogs.

2.4. Conflict of Interests between Importing/Exporting Countries

The WTO/SPS Agreement grants each member state the right to implement restrictions on international trade to protect sanitation of its animals. However, the level of protection in the importing country must be minimized to conform to the international standards, and more severe measures need to be based on scientific risk assessment.

On the other hand, there is a level of conflict between protecting a nation's environment, agricultural infrastructure and the consumers' safety and rights, and prohibiting groundless and excessive restriction on international trade. The position of exporting countries that worry about SPS measures being used as non-customs obstacles co-exist with the position of importing countries that worry about the people's concern about health, sanitation and environment. There is also a limit to clearly determining the scientific justifiability and legality of SPS measures, which opens up the possibility of bilateral trade conflicts at all times. Moreover, when the level of people's concern for health and environment is

high, trade conflicts caused by quarantine may spiral into domestic conflicts between the government and the people, causing various social issues including distrust towards the government.

In South Korea, the Livestock Diseases Prevention Act was revised in 2008 to conduct import risk analysis on the possibility of contagious disease outbreak caused by the import of quarantined products, and risk assessment models for FMD-free areas, FMD vaccination-free countries and Highly Pathogenic Avian Influenza were developed and applied in 2010, which contributed to resolving conflict with exporting countries and gaining trust from the international society. In order to minimize bilateral trade conflicts, these models need to be diversified and expanded for each product, country and importation paths, to secure scientific justifiability and reasonably resolve conflicts of interests between the countries.

A department committed to risk assessment was established to properly respond to requests for import of overseas agricultural products, and the country has been actively participating in bilateral/multilateral conferences to promote understanding of South Korean systems and provide scientific justification. In addition, local pest investigation and quarantine have been actively performed to prevent release of pests into the area.

Additionally, separate research projects on quarantine of exported plants are being implemented to expand exports, and overseas plant quarantine experts are being invited to South Korea to verify the safety of South Korean agricultural products, which is expected to expedite the negotiation process.

2014 Modularization of Korea's Development Experience
The Advancement of Animal and Plant Quarantine

Chapter 6

Implications for Developing Countries

1. Construction of Quarantine System in Developing Countries
2. Plan for Transferring South Korean Experiences with Animal and Plant Quarantine Policies to Developing Countries

Implications for Developing Countries

1. Construction of Quarantine System in Developing Countries

1.1. Establishment and Continued Implementation of Systematic Comprehensive Plans

Quarantine is one of the tools of government policies to be developed independently to respond to natural, industrial, political environments, the international trade environment, and social/cultural situations. Since most developing countries are agricultural countries, implementation of quarantine policies should be aimed at expanding export of agricultural/livestock products. Above all, it is imperative to set the future direction and establish mid-long-term comprehensive plans for such direction, and derive phase-specific tasks, so as to consolidate a government-wide consensus to implement the policies.

Since most developing countries are agricultural countries, implementation of quarantine policies should be aimed at securing a quarantine system on par with developed countries. Under the basic objective of expanding export of agricultural/livestock products, improving the production environment so that it reaches the level that conforms to the quarantine requirements of the importing countries, specific tasks should be established in consideration of the country's circumstances.

Mid-long-term plans should be developed at the national level, which will facilitate cooperation from budget departments in securing the needed funding for each phase of implementation. In addition, the mid-long-term plans should ideally be established once

every five years, and phase-specific plans once every two to three years. Specifying this scheme into the relevant laws and systems will be conducive to laying the groundwork for more stable implementation of the projects.

1.2. Adoption of Efficient Quarantine Methods Suitable for each Country's Reality

It would be desirable to adopt efficient quarantine methods suitable for each country's circumstances, considering that the level of economic and social infrastructure vary greatly depending on the country. In South Korea, the early advancement of ICT's and the Internet environment enabled the construction of the quarantine information system in a short time. While the computer systems themselves can be transplanted into other developing countries, the Internet environment differs from country to country, which may restrict transfer of the remote real-time communication system.

South Korea has been recognized for its adoption of the quarantine detection dogs system, and the country is still building its know-how on quarantine technologies and operation, so as to further enhance its currently achieved success. In particular, South Korea needs to find new demands such as the capability to inspect ground vehicles, and continue with education and training aimed at teaching the relevant skills. To achieve this, benchmarking is required for on-site technologies, as well as mid-long-term strategies for advancement of the quarantine detection dogs system of each country.

In addition, the level of South Korea's quarantine detection dogs system has reached the level where the country is capable of transferring its technologies to other countries that are considering adoptingthe system. Surrounding countries including Japan has benchmarked the South Korean case, and a MOU was signed with China for exchange of technology related with quarantine detection dogs. These cases can be further expanded to transfer South Korea's expertise to other countries with a high demand and interest for the system, which will contribute to enhancing South Korea's image.

Quarantine detection dogs are expected to play a key role in protecting the livestock industry at border quarantine sites such as airports, ports and international post offices. Ensuring continued activities of detection dogs in various areas requires expanding the operation workforce (handlers). There are currently 18 handlers, and they have been suffering from fatigue caused by maintenance training, deployment to local airports and ports, extensive management of risky lines both day and night, which also limits their opportunities for systematic education and training for operation of the detection dogs system. To overcome

these limitations, the work areas and departments need to be specialized into training and management of quarantine detection dogs, and on-site operation. In addition, the quarantine detection dogs stationed at three regional agencies need to be further deployed to airports and ports that operate considerable number of risky lines, and the detection skills should be diversified to account for diverse transportation types, such as ships and automobiles.

1.3. Consensus on the Importance of Quarantine

The basic mission of animal and plant quarantine is to secure food safety by preventing the introduction of animals and plants disease from overseas. Therefore, the role of animal and plant quarantine should not be confined to importation restrictions to protect the country's industries: quarantine needs to be recognized as a public good that plays a critical role.

That is, thorough animal and plant quarantine not only protects and develops the relevant industries, but also protects the people's health and lives. Such change in perception will result in understanding the utmost importance of quarantine. This importance is enhanced in countries that depend on animals, plants and food products from overseas, which might function as the vessel for disease transmission amid increased personnel and physical exchanges of today.

2. Plan for Transferring South Korean Experiences with Animal and Plant Quarantine Policies to Developing Countries

2.1. Technology Transfer and Expert Training through ODA Projects

South Korea's rapid economic growth drew much interest from other countries, making South Korea a model for economic growth achievable by developed countries. In response to such expectations, South Korea expanded its government official development assistance (ODA) projects in the field of international cooperation for quarantine.

Invitation of ASEAN plant quarantine experts has been ongoing since 2006. About 20 quarantine experts are invited to South Korea for lectures on international standards, domestic laws and systems on plant quarantine, visits to quarantine sites to better understand the importance of scientific inspection and computerization system, and visits to export

farms and companies to better understand the importance of production site management. This greatly contributed to exacting changes in perception on the need for quarantine, and exchanging the policy directions based on the specific environment of each country. However, advancement of the overall national system requires development of various technological transfer programs aimed at developing expertise of quarantine officers in the field.

Australia, Canada, the US and other developed countries have been operating technological transfer programs to spread the understanding on its own quarantine system, from which South Korea once acquired advanced technologies.

However, the gap of quarantine infrastructure between developed countries and lack of capital and technological expertise in some countries may limit reception of the transferred technologies from developed countries. Therefore, South Korea needs to operate customized technological transfer programs to account for the quarantine infrastructure of developing countries.

In case of operating expert training and technological transfer programs focused on areas of interest of developing countries will also greatly benefit the developed countries. However, South Korea will also benefit from the opportunity to monitor and share pests information and consulting with exporting countries regarding import sanitation conditions through import risk assessment. Therefore, it is expected that a scientific and reasonable conclusion can be derived from such cooperation.

As for animal quarantine, South Korea has been facing elevated requirements and expectations from developed countries on transfer of border quarantine techniques, diagnosis technologies and other operational know-how accumulated over the years. South Korea experienced a FMD and HPAI outbreak, and through these experiences elevated its level of disease control capability in terms of management of livestock-related persons, extensive operation of quarantine detection dogs, operations of disinfection tanks and collaboration with CIQ-related agencies for border quarantine reinforcement. By having the opportunity to transfer this know-how, South Korea will be able to not only improve its national image, but also acquire the opportunity to implement joint measures to eradicate livestock contagious diseases. The receiving country will also enjoy the opportunity to acquire operational know-how from South Korea.

Since quarantine experts who led the advancement of the quarantine system in South Korea are retiring starting from 1995, these experts can be dispatched to developed countries for technological transfer programs that provide policy, technological advice. It will be a way to achieve early advancement of quarantine systems in developing countries.

Such international cooperation has already been achieved in the form of field support projects for agricultural technologies by the Rural Development Agency. Benchmarking the success of this project will result in achieving positive outcomes in a short period of time. In particular, by using the experts dispatched to developing countries as monitoring personnel for the dispatched area, South Korea will be able to acquire more accurate information on the surrounding countries, and establish a basic understanding for how to reduce hazards in terms of import risk assessment.

2.2. Joint Workshops and International Seminars

Cases involving conflicts caused by quarantine measures were frequently caused by lack of scientific basis, differences in political and industrial understanding between the parties, or lack of cultural understanding.

These problems are caused by the fact that each country establishes and interprets scientific justification from its own perspective, which makes it harder to clearly determine the legality of measures taken by the importing country. Joint workshops on conflict cases need to be organized to review the cases in which developed countries are commonly interested, so as to expand the basis for reasonable understanding.

Considering that most developing countries are agricultural countries this will provide the opportunity to understand the possibility of conflicts in advance, and close the gap of understanding between the participating countries.

International seminars with quarantine experts will provide the opportunity to promote academic and technological understanding of the general interests of both exporting and importing countries, including local quarantine and scope of monitoring.

South Korea needs to be more active in contributing to organizing such seminars as a member of animal and plant quarantine organizations such as the OIE and IPPC, for example by linking the seminar topics with those from multi-lateral seminars organized by international organizations such as the UNDP, FAO and APEC.

Such activities will contribute to improving the national image, accumulating the related technologies, and consolidating South Korea's standing for multi-lateral and bi-lateral negotiations.

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