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2012 Modularization of Korea's Development Experience:

Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

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Ministry of Agriculture, Food and Rural Affairs

KREI
Korea Rural Economic Institute

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Preface

The study of Korea's economic and social transformation offers a unique opportunity to better understand the factors that drive development. Within one generation, Korea has transformed itself from a poor agrarian society to a modern industrial nation, a feat never seen before. What makes Korea's experience so unique is that its rapid economic development was relatively broad-based, meaning that the fruits of Korea's rapid growth were shared by many. The challenge of course is unlocking the secrets behind Korea's rapid and broad-based development, which can offer invaluable insights and lessons and knowledge that can be shared with the rest of the international community.

Recognizing this, the Korean Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched the Knowledge Sharing Program (KSP) in 2004 to share Korea's development experience and to assist its developing country partners. The body of work presented in this volume is part of a greater initiative launched in 2010 to systematically research and document Korea's development experience and to deliver standardized content as case studies. The goal of this undertaking is to offer a deeper and wider understanding of Korea's development experience with the hope that Korea's past can offer lessons for developing countries in search of sustainable and broad-based development. This is a continuation of a multi-year undertaking to study and document Korea's development experience, and it builds on the 40 case studies completed in 2011. Here, we present 41 new studies that explore various development-oriented themes such as industrialization, energy, human resource development, government administration, Information and Communication Technology (ICT), agricultural development, land development, and environment.

In presenting these new studies, I would like to take this opportunity to express my gratitude to all those involved in this great undertaking. It was through their hard work and commitment that made this possible. Foremost, I would like to thank the Ministry of Strategy and Finance for their encouragement and full support of this project. I especially would like to thank the KSP Executive Committee, composed of related ministries/departments, and the various Korean research institutes, for their involvement and the invaluable role they played in bringing this project together. I would also like to thank all the former public officials and senior practitioners for lending their time, keen insights and expertise in preparation of the case studies.

Indeed, the successful completion of the case studies was made possible by the dedication of the researchers from the public sector and academia involved in conducting the studies, which I believe will go a long way in advancing knowledge on not only Korea's own development but also development in general. Lastly, I would like to express my gratitude to Professor Joon-Kyung Kim and Professor Dong-Young Kim for his stewardship of this enterprise, and to the Development Research Team for their hard work and dedication in successfully managing and completing this project.

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

May 2013

Joohoon Kim

Acting President

KDI School of Public Policy and Management

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Summary

Farmland consolidation is the act of consolidating a series of fragmented and irregular farmland plots to enlarge plot their size and support sufficient irrigation. Farmland consolidation also combines and groups the proprietor's farmland into one area by administrative give-and-take as well as division-and-junction of their land. Moreover, it also includes the rearrangement of farmland, which is small or lacks sufficient infrastructure due to farmland consolidation or earthwork waterways projects that were done in the past. Such areas can be reconsolidated into a larger scale production by employing farm machinery.

The first Farmland Consolidation Project in Korea was implemented for the sake of Increased Yield of Rice-Plan (1940) by Japan. In 1945 the performance of the project was to 24,000ha. After Korea gained independence, the Farmland Consolidation Project was initially implemented by Gyeongsangbuk-do (1964) with 247 districts (5,806ha). At that time, 62% of the total agricultural output was rice production, while 9% was barley production. This indicates that the agricultural production system was mainly based on rice and, to a lesser extent, barley. The rice production per unit of area was low at about 300kg per 10a. The total number of agricultural machinery distributed was 2.5 million nationwide where farming families had approximately 1,000 cultivators, 26,000 water meters, and 19,000 power threshers. The total area of paddy's that had an irrigation system installed was 701,000ha (55%) of the total paddy area (1,286,000ha). The demand for the development of agricultural water was the highest out of all of the Agricultural Infrastructure Improvement Projects. In addition, the distribution rate of agricultural machinery was extremely low. Farming households were overpopulated with regard to the fact that farming families made up 52% of the total households and the farming population was 55% of the total population. It is not too much to say that there was no demand for farmland consolidation from farming families in 1965. However, the local administrative offices forced the people into conducting the Farmland Consolidation Project by using their government authority.

During the 1960s more than 50% of the total cost of the Farmland Consolidation Project relied on the efforts of the farmers. Also, the funds were covered by grain-kind and the municipal government. For these reasons, the plan was severely opposed by farmers. The farmers' perception of farmland consolidation was changed in a positive way in the 1970s, the project scale was expanded up to about 25,000ha and the financial support was also increased with central government contributing 50%, the municipal government contributing 30%, and land owner contributing 20%. As farmland consolidation became the core project for agricultural production infrastructure improvement in the 1980s the total expense and scale of the project was also expanded. The scale of the project was initially 12,000ha per year, but it has increased by more than 20,000ha, reaching 24,681ha with 200.9 billion won in funding by 1989. Aside from the general Farmland Consolidation Project, in the 1990s many other projects have been implemented including: Upland Improvement Projects, Farmland Rearrangement Project, On-farm Road Improvement Projects. During the next decade the general Farmland Consolidation Project was discontinued in 2004 with 721,000ha.

The characteristics of the development process of the Farmland Consolidation Project, which has been currently conducted since 1964 are summarized as follows.

First, the project volume has been gradually expanded. The annual average areas where farmland consolidation was implemented were 14,000ha (1960s), 20,000ha ranging from 13,000 to 31,000ha (1970s), 19,000ha ranging from 13,000 to 28,000ha (1980s), 29,000ha ranging from 18,000 to 53,000ha (1990s), and 8,000ha ranging from 3,000 to 17,000ha (2000s).

Second, the kinds of the Farmland Consolidation Project have been diversified and its range has been expanded. The Upland Improvement Project, and The Farmland Rearrangement Project were introduced in 1994. The On-farm Road Improvement Project was introduced in 1995. The target area of farmland consolidation was expanded from paddies to uplands. The size of the farmland consolidation section was expanded from a small block to a large block. The expansion and pavement of farm roads was added as a result of clustering farmland and the renovation of irrigation/drainage channels. In addition to the physical renovation of farmland, the project aimed to improve the agricultural structure relating to things like the grouping of farmland and the expansion of the scale of farms.

Third, the assistance system for the Farmland Consolidation Project was expanded and supplemented. The rates of government subsidy for the Farmland Consolidation Project were 30% (Japanese colonial era), 40% (1960s-early 1970s), and 50% (late 1970s-early1980s). From the late 1980s to the early 1990s, government funding was 60%; municipal government funding was 20%; the charge to the beneficiary was 20%. After the

late 1990s, government funding was 80% and municipal government funding was 20%, meaning that the beneficiary charge was waived.

To implement the Farmland Consolidation Project, the relevant organization, procedures, and financial assistance should be prepared. The relevant legislation including farmland consolidation refer to the ordinances that define the overall agricultural infrastructure improvement project, such as the 「Land Improvement Project Law」 (1960s) and the 「Agricultural Community Modernization Promotion Act」 (1970s, 1980s). After 1995, the agricultural infrastructure project was conducted, based on the 「Rearrangement of Agricultural and Fishing Villages Act」. The names of the project operators for the Farmland Consolidation Project have been changed from the Japanese colonial era to the present, depending on the national government, the local government, and the time period. However, they have not been changed for land owners, the unions and public corporations in charge of agricultural infrastructure improvement project. Also, the participants in Farmland Consolidation Project remained the same as the person who have ownership of the land on which the Farmland Consolidation Project is conducted. In either case, the consent and participation of the project participants, such as land owners within the project sites, should be required. The regulations related to the Farmland Consolidation Project stipulate that the project should be consented to by more than 2/3 of project participants.

The implementation procedures of the Farmland Consolidation Project had been slightly different until 1994, depending on the types of project operators. However, the basic procedures included ① application for project implementation, ② assessment, notification, and disclosure to the public, ③ formal objection, and ④ approval of project implementation and notice. These procedures have changed significantly because of the 「Rearrangement of Agricultural and Fishing Villages Act」, which has been in effect since 1995. The changes included that research on the resources of the land should be done and the establishment of plan should be completed prior to the application for project implementation. To conduct the Farmland Consolidation Project, research on the resources of the whole area where the project is to be carried out should be done. Based on the research, the integrated plans for farming and fishery village development and the plan for agricultural production infrastructure improvement should be established. According to those plans, planned site investigations were carried out. Then, the basic plan is to be established through the basic investigation of the feasibility of the agricultural infrastructure development project. Finally, the detailed designs and implementation plans for the sites are to be made. Also, the project operator is assigned after the application for the project. Unless financial assistance, such as government subsidy, is applied for properly when relying on the Farmland Consolidation Project, the implementation of the project will be difficult because the burden of the project participants will increase and the project expenses cannot be procured smoothly.

2012 Modularization of Korea's Development Experience
Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

Chapter 1

Introduction

1. Purpose of This Study
2. The Scope and Contents of Study

Introduction

1. Purpose of This Study

Farmland consolidation is the act of consolidating a series of fragmented and irregular farmlands to enlarge plot size and support sufficient irrigation. Farmland consolidation also means the act of combining and grouping the proprietor's farmland into one area through an administrative give-and-take and a division-and-junction of their re-plotted land. It also includes the readjustment of farmland that was small or lacking sufficient infrastructure due to farmland consolidation in the past or earthwork waterways. Such areas can be reconsolidated on a large scale by using farm machinery. Therefore, the project is involved in ① the standardization and scaling of traditional plots which have been fragmented and irregular in shape, ② the enlargement of farm size suitable for large farm machinery, ③ the modification of irrigation and drainage canals for improving water management efficiency, ④ the construction, expansion, and modification of farm roads to create easy access for farm machinery, ⑤ the improvement of soil layers for securing plow layers, such as soil conditioning and soil coverings, ⑥ the site renovation for public agricultural facilities (e.g., collection place of loads, places for drying apparatus).

The first Farmland Consolidation Project in Korea was implemented for the sake of Chosun increased yield of rice-plans (1940) by Japan. The initially proposed size in the plan was 13,000ha but it was expanded up to 66,000ha in Chosun increased yield of the rice-revision plan (1942). In 1945, however, the project decreased the size by as much as 24,000ha.

After Korea gained independence, the Farmland Consolidation Project was initially implemented by Gyeongsangbuk-do (1964) with 247 districts (5,806ha). Since 1965, the project has been conducted by the central government. During the 1960's more than 50%

of the total cost of the readjustment project relied on the farmers' efforts and the investment resources were covered by the grain and municipal government. For these reasons, the plan was very much opposed by farmers. However, the target area of the national farmland consolidation in 1969 was 588,000ha, which accounted for 45% of the total farmland.

With the 1970's modernization movement in rural communities, the farmers' perception of farmland consolidation changed in a positive way and the project scale expanded up to approximately 25,000ha and financial support also increased with the central government standing at 50%, the municipal government at 30%, and the farmers at 20%. Since 1975, the amount of the financial aid has exceeded 10 billion won. Moreover, the quality of the farmland consolidation has improved so much that the project expenses per hectare could have been expanded from 20,000 won at the beginning, to 60,000 won in 1975, and to more than 200,000 won in 1979.

As farmland consolidation became the core project for agricultural production infrastructure improvements in the 1980's, the total expense and scale of the project was also expanded. The scale of investment increased from 52.2 billion won in 1981, to 74.4 billion won in 1985, and to 117.2 billion won due to the 'Comprehensive plan for agriculture and fishery' in 1986. The scale of the project was initially 12,000ha per year but was increased by more than 20,000ha, reaching 24,681ha with 200.9 billion won in 1989.

Aside from the 1990's general Farmland Consolidation Project, the field-oriented modification project, the readjustment project of large arable land, and the on-farm road improvement project have all been implemented. In the 2000's the general Farmland Consolidation Project was discontinued in 2004 with 721,000ha.

The purpose of farmland consolidation was to increase agricultural productivity and to reduce production costs. The effects were as follows: first of all, there can be direct effects such as an increase of water, a reduction of the labor force, an increased rate of arable land utilization, a reduction of production costs, an increase in profitability, and a reduction of the loss of water and maintenance expenses. Secondly, there are indirect effects including the enhancement of public interests such as environmental conservation, prevention of natural disasters through the improvement of drainage systems, and the improvement of transit facilities. Also, another type of indirect effect is the farmer's changing perception with regard to increasing their desire to expand farming scale and strengthening their ideas for settlement in rural areas.

This study is intended not only to investigate the process, achievement, and outcomes of the Farmland Consolidation Project, which has been constantly implemented since the late 1960's, but also to draw out the implications of these findings.

Table 1-1 | The History of Farmland Consolidation Project

	Before 1945	1960's	1970's	1980's	After 1990's
Main agent of project	Irrigation association, individual	Local government	Government	Government	Government
Related laws and regulations	Land Improvement Project Act	Land Improvement Project Act	Agricultural Community Modernization Promotion Act	Agricultural Community Modernization Promotion Act	Rearrangement of Agricultural and Fishing Villages Act
Financial resources	Government funding	PL480 grain	Government funding 50%	Government funding 60-70%	Government funding 80%
		Municipal government	Municipal government 30%	Municipal government 20%	Municipal government 20%
	Farmer	Farmer	Farmer 20%	Farmer 20-10%	
Implementation area	-	84,153ha	201,732ha	188,249ha	248,776ha
Section	20-30a	Mountain areas 20-30a	Mountain areas 20-30a	Mountain areas 20-30a	Mountain areas 20-30a
		Field areas 20-40a	Field areas 30-50a	Field areas 30-50a	Large sections 100-200a
Irrigation and drainage canal	Earthwork	Earthwork	Earthwork and construction	Earthwork and construction	Earthwork and construction
Farm road	2-2.5m	2.0-3.0m	3.0-6.0m	4.0-7.0m	4.0-7.0m
Replotting	Replotting in the original position	Replotting in the original position	Original position and compromised replotting	Original position and compromised replotting	Original position and compromised replotting
					The replotting of multiple ownership lands
Construction	Human resources	Human resources	Human resources and machinery	Human resources and machinery	Human resources and machinery

Source: Korea Rural Community Corporation (KRC), Rural Agricultural Water Resource Information System (RAWRIS) (https://rawris.ekr.or.kr/RawrisMIS/2010/sub56.aspx)

2. The Scope and Contents of Study

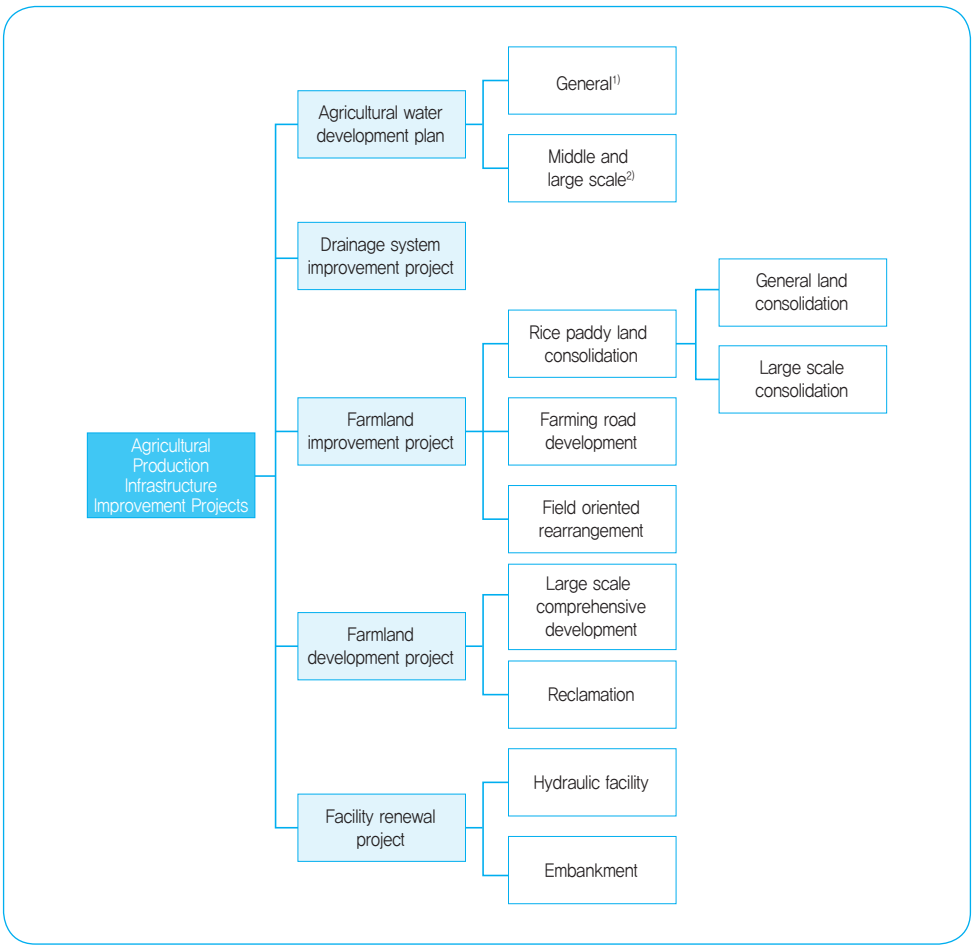
2.1. The Scope of Study

This study primarily focuses on the Farmland Consolidation Project, which is one of the agricultural production infrastructure improvement projects. As seen in [Figure 1-1], the agricultural infrastructure projects can be divided into the agricultural water development plan, the drainage system improvement project, the farmland improvement project, the farmland development project, and the facility renewal project. Above all, the agricultural water development plan, the farmland improvement project, and the farmland development project are the most important components. Since the Farmland Consolidation Project is one of the farmland improvement projects, it includes rice paddy farmland consolidation, field oriented consolidation, and the expansion and on-farm road improvement projects. The agricultural water development plan and the farmland improvement project, belong to the farmland development project such as large scale comprehensive development and reclamation, are not seen as individual projects but are categorized into the farmland development project. Hence, these are not included in the Farmland Consolidation Project.

In regard to indirect aspects, the range of time periods to be studied in this research begins with the Japanese colonial era when official land improvement projects started to be implemented under the modern legal system. Then, the range of time also included 47 years between 1965 and 2011 when the Farmland Consolidation Project began directly under Korean government policy. The general Farmland Consolidation Project ended up until 2004. Nevertheless, the time scope of this research continued up to 2011 because the readjustment project of large arable land and the field-oriented modification project were still ongoing since 2004.

The scope of content in this study includes the process, the system, the achievements and effects, and the implications of the Farmland Consolidation Project. The Farmland Consolidation Project includes the rice paddy Farmland Consolidation Project, the field-oriented modification project, and the expansion and on-farm road improvement project. Also the rice paddy Farmland Consolidation Project includes the readjustment project of large arable land, as well as the general Farmland Consolidation Project.

Figure 1-1 | The Classification of Agricultural Infrastructure Improvement Project



Note: 1) Small-scale surface water development and augmentation, and groundwater
2) More than 50ha surface water developments

2.2. Contents of Study

The contents of this study are as follows:

1. The significance of the Farmland Consolidation Project and its background (Why)
   1) Basic components and significance of the Farmland Consolidation Project
   2) Background of the Farmland Consolidation Project (historical background)
2. The process of Farmland Consolidation Project (What)

1) The local government's attempt at farmland consolidation (late 1960's)

2) Increasing demand for farmland consolidation and its expanded distribution (1970's)

3) Modernization of maintenance regarding the improvement of agricultural structures (since the 1990's)

3. The implementing system of the Farmland Consolidation Project (How)

1) The enactment and amendment of laws and regulations relevant to the Farmland Consolidation Project

2) The implementation system of the Farmland Consolidation Project and its process

3) The financing of the Farmland Consolidation Project

4. The outcome of the Farmland Consolidation Project and its effects (Evaluation)

1) The achievement and outcome of the Farmland Consolidation Project

2) The effects of the Farmland Consolidation Project

3) The challenges of the Farmland Consolidation Project

5. Implications (Benchmarking)

Chapter 2

Significance and Historical Background of the Farmland Consolidation Project

Significance and Historical Background of the Farmland Consolidation Project

1. Basic Components and Significance of the Farmland Consolidation Project

1.1. Basic Components of the Farmland Consolidation Project

The goal of the Farmland Consolidation Project is to rearrange fragmented and irregular plots without farm roads and irrigation, with small and narrow areas of soil to make the plots into a more proper size. While the projects are also involved in constructing, expanding, or readjusting the farm roads and irrigation/drainage canals, the projects consolidate the proprietor's farmland into one area through an administrative give-and-take and division-and-junction of their replotted land. Therefore, the projects focus mainly on the readjustment of the division, farm roads, irrigation/drainage canals, and replotted lands. Each component basically requires the following qualifications:

① One side of the rice paddy should be road accessible so the produce can be distributed easily, ② the size and shape of the divided sections should be properly set-up for the efficient use of farm machinery, ③ the rice paddy should be dried easily for the effective use of farm machinery, ④ every section should be accessible through irrigation/drainage canals. The following explains this in detail (Rural Development Corporation (RDC), 『Comprehensive Bibliography on the Agricultural Infrastructure Project』, 1999, pp. 550-554).

The size and shape of the division is determined by evaluating technical conditions (i.e., the efficiency of farm machinery operations), geographical conditions (i.e., land slope, soil), water conditions (i.e., the operation of irrigation/drainage), and socioeconomic conditions (i.e., the current status of landownership, farm sizes, and the difficulty of consolidation/replotting). The operational efficiency of plowing/leveling/pulverizing/fertilization/seeding

/weeding/pest control/harvest by farm machinery depends on the size and shape of the division. The efficiency increases as the length of the longer side of the division increases and the ratio of the shorter side to the longer side increases. This is due to the fact that the number of the farm machinery's back and forth decreases. In case of sloped terrain, it is economical to make the longer side of the division parallel and to make the shorter side rectangular to contour. For easier irrigation of the rice paddy, the proper size of lot is around 0.5ha. In clay soil, the longer side needs to be less than 100m because the bottom of the paddy with clay soil tends to be uneven. The size of the division also relies on the scale and method of farm management. Even in the same area, the conditions of the soil and irrigation/drainage could be different among different lots so that this might lead to the conflict of interest between farmers. It is, therefore, better to complete the group farming land per farmer into 2-3 subdivisions.

The farming roads are divided into three parts, a main road, a service road, and a cultivation road. It is more convenient for farming if the farming roads are wide and dense. However, the reduction rate of the lot increases due to the fact that the areas become incorporated into the road site. Therefore, the width and positioning of the road becomes one of the biggest issues in the phase for establishing the farmland consolidation plan. The readjustment of farmland consolidation divisions implemented in the past results mainly from the issues related to farming roads. When planning for future farming roads in the next 20-30 years, considerations should be made for high performance large farming machinery.

Irrigation and drainage canals are divided and added to the side of the division. A link canal is installed to reuse the irrigation canal for drainage. Drainage systems are divided into surface drainage and subsurface drainage. Subsurface drainage aims to increase the production rate of the dry paddy field. However, the farmland consolidation plan for introducing farm machinery is focused on increasing bearing capacity.

Land replotting is the process of transmitting the right of administrative give-and-take and division-and-junction of replotted land. Farmland consolidation ends by replotting and the replotting process can be divided in two ways: replotting in the original position, of which the approach is to consolidate the farmland around the original place, and the replotting of multiple ownership lands, which is implemented by allocating the farmland through the comprehensive land readjustment plan regardless of the original location of the farmer's land. Farming roads and water ways are constructed through farmland consolidation and the divisions are rearranged to reshape of the farmland from its original form. Because of this, it is difficult for farmers to obtain the original location, even in the case of replotting in the original position. For grouping the farmlands, replotting of multiple ownership lands is desirable.

1.2. The Significance of Farmland Consolidation Project

As mentioned before, the Farmland Consolidation Project involves ① the enlargement of farmland lot sizes and the rearrangement of its shape in a structured way, ② the construction, expansion, and pavement of farming roads, ③ the separate installation of structures for irrigation and drainage canals, ④ the consolidation of farmland by replotting and the administrative give-and-take and division-and-junction of replotted land. Therefore, the Farmland Consolidation Project leads to the direct and indirect effects in the following ways.

Firstly, the use of large farm machinery leads to a significant reduction of labor forces put into the overall farming operations. Large farming equipment such as tractors, rice transplanters, and motorized pest controllers can be combined to increase the operational efficiency due to the large scale of lots and the consolidation of work into one place.

Secondly, the rearrangement of irrigation and drainage canals make it possible to benefit from agricultural water sufficiently, which can prevent damage caused by floods. Moreover, it reduces the loss of water and the cost of water management, which increases productivity by reducing the production costs.

Thirdly, the consolidation of farmland can decrease the labor force and production costs and increase the production costs.

Fourthly, there are indirect effects including the enhancement of public interests such as environmental conservation, prevention of natural disasters through the improvement of drainage systems, and the improvement of transit facilities. Also, another type of indirect effect is the farmers' changing perceptions and their desire to expand the farming scale and strengthen their ideas of settlement in rural areas.

The Farmland Consolidation Project and the agricultural water development plan, are two primary projects for the improvement of the agricultural production infrastructure. The project is significant because it is essential for agricultural development.

2. Historical Background of the Farmland Consolidation Project

2.1. Land Improvement Projects in the Japanese Colonial Era

From the Chosun era to the Japanese colonial era, the agricultural infrastructure project was limited to farmland developments such as the installation of hydraulic facilities including dams and weirs. According to "The Chronicles of the Three States", there were

historical records with regard to the construction of embankments (222, King Kusu, Baekje), new constructions (330) and extensions (790) of Byeokgolgi, and the new construction of reservoirs (429). During the era of the Three States and the unified Silla, Uirimji (Jaecheon), Susanje (Miryang), Daejeji (Uisung), Gonggumji (Sangju), Cheongje (constructed in 798, Yeongcheon), Nulje (Jeongeup), and Hapdeokji (Dangjin) were constructed. In the era of the Goryeo Dynasty, with regard to cultivation and reclamation, the 24th year of Gwangjong (973) ordered the cultivation of Jinjeon, which was abandoned farmland, and in the 6th year of Yejong (1111) a waiver of two years was enacted for farm rent for the farmers who cultivated the land. In the 35th year of Gojong (1248), Bang-Kyoung Kim conducted the reclamation of the embankment at Wido, Anju and the embankment was constructed at Ganghwado for provisions for the army in the 43rd year of Gojong (1256). When it comes to dam construction, the historical records indicate that an extension of Byeokgolge was built in the 21st year of Injong (1143), dam construction was built in the 18th year of Myeongjong (1188), the embankment construction (June) and reconstruction (August) from the south of Yeonbokjeong in Gangreung was built in the 24th year of Uijong (1169). Also during this period of military regime, the reserve reservoirs operated by Jungbang were constructed every year in the spring and autumn by soldiers.

Since the end of the 15th century in the Chosun era, there was increasing interest in the development of Eonjeon around the coastal areas in Jeolla, Chungcheong, and Gyeonggi-do. Since the mid-16th century, the construction of banks by the people who worked for Kwonsinseaga had been frequently observed in Hwanghaedo and Pyeongando, as well as the three provinces mentioned above. In the early period of the Chosun era, cultivation had mainly been implemented around the outskirts of Pyeongando and Hamkyoungdo for the purpose of creating a garrison farm cultivated by stationary troops and a relocation policy for the people.

There are many historical records about dam construction in the Chosun era. Some of the examples are as follows: Taejong 14th year (1413) was ordered to investigate any possible arable lands by completing the proper irrigation system and reconstructing the old dams. During Taejong 18th year (1417) Byeokgolje demolished around the end of the Goryeo dynasty and five water gates were constructed for two months by 10,000 civilians and 300 supervisors. In the first year of Sejong (1418) 11,580 people were mobilized for two months to make Nulje in Jeongeup. In Seongjong in the fourth year (1472), special officers were dispatched to repair Hapdeokjae, which collapsed due to flooding.

During Jungjong's 31st year in 1536, 400 priests were mobilized to construct embankments in Gwangju-gun, Gyeonggi-do. During Yeongjo's 16th year in 1739, military forces including Yeongun, Sokogun, and Seunggun were mobilized to construct embankments in the Nakdong River. During Jeongjo's second year in 1777, ?Jaeeunjeolmok?, including 11

sections, was published to ban farming in restricted areas. Also 4,553 people from Hongju and 3,500 people from other areas were mobilized to build Hapdeokjae. Furthermore, during Jeongjo's 16th year, 6,500 people constructed Hapdeokjae. In his 19th year right after the construction in Hwaseong, the garrison farm was prepared and irrigation facilities such as Manseokgeo and Mannyeonje were also constructed. Since the Sunjo era, frequent riots occured due to the reign of monarchs and financial derangements and consistent droughts and famine. Many dams were demolished and farming in the restricted areas became widespread.

The characteristics of hydraulic facilities in the Chosun era can be summarized as follows: first, the mainstream of hydraulic facilities were transformed from dams to weirs after the 16th century. Secondly, most of the dams in the Chosun era were small-scale dams less than 2m in depth. Because of this, lots of dams were closed and transformed into farmland and farming was widely conducted in restricted areas. Thirdly, most of the embankments located around the river stream, which was one of the hydraulic facilities, were constructed by individuals who owned farmland near the river while dams and weirs were co-constructed. The local government elected Gweonnonggwan annually from each Dong area so that small dams were required to be reported to Dong and the large dams were to be reported to the local government. Construction was completed by mobilizing people from several Myeons and Dongs. From time to time, Yeongun, Sokogun, and Seunggun were mobilized and they were given foods as a relief policy for the construction. Fourthly, most hydraulic facilities were owned by the nation or public. The management was carried out by rural communities such as the Mongligae, Bogae, and Jeongae, or by administrative offices and Gungbang.

During the Japanese colonial era, agricultural infrastructure projects called land improvement projects, were expanded drastically with respect to quality and quantity and can be summarized as follows. Firstly, the Land Improvement Projects were implemented through the strong support of the country and the irrigation association was its center of support. Secondly, the Land Improvement Projects were continually promoted for a long-term period in accordance with the increased yield of rice-plans to solve the food crisis in Japan. Thirdly, the Land Improvement Projects still focused on the development of agricultural water and farmland; however, the readjustment projects of arable land were first conducted by Chosun, and increased the yield for the rice-plan in 1940. Fourthly, even though The Land Improvement Projects aimed to produce a high yield of rice, the lack of food in the country was aggravated because most of the rice yield was exported to Japan, rather than staying in Korea.

Above all, as laws and regulations were created for the irrigation association, in 1906, the Korean government enacted the Irrigation Association Ordinance, under the guidance

of the Japanese Resident-General. Again in 1908, the 「Installation Guidelines For Irrigation Association And Exemplary Ordinance」 was enacted to grant to the irrigation association the right to charge the cost and labor required for the operation of the association to the association members. Hereafter 1910, beneficial areas had accounted for 7,980 and six associations were established. The Japanese regulatory system for the irrigation association was completed by the 「Chosun Irrigation Association Ordinance」, which was issued in 1917. This irrigation association was established due to the fact that the number of landowners, except for the tenants, as members of the association, would have to consent to at least 1/2 of the owners and the landowners obtaining more than 2/3 of the total land area. In 1919, the 「Secondary Regulation of Irrigation Association」 was issued to indicate that the irrigation association project with more than 200 Jeongbos and more than ¥ 40,000 for the construction cost budget could issue grants within 15% of the construction cost budget. Also if the association submitted the application, the Chosun Governor General's Office conducted the survey of its project site, measurement, and design.

The Land Improvement Projects were carried out in earnest by the first increased yield of the rice-plan. Even though the increased yield of the rice-plan was to be conducted with the farming improvement project, as well as the Land Improvement Projects, it was focused on the latter. In particular, the majority of funding was committed to the irrigation enhancement. During the first increased yield of the rice-plan period (1920-1925), the secondary expansion and district survey for land amendments were conducted.

Aid regulations for Land Improvement Projects were enacted in December 1920. They extended from the previous target aid subjects of more than 200 Jeongbos and more than ¥ 40,000 of construction costs to any subject with more than 30 Jeongbos of irrigation enhancement/conversion of land categories (grant rate: less than 20% of irrigation enhancements, less than 25% of conversion of the land category), more than 10 Jeongbos of cultivation/reclamation (grant rate: less than 30%), and more than ¥ 5,000 of construction costs. The basic survey for the improvement of farmland expansion was carried out so that more than 200 Jeongbos were issued.

During the second period of the increased yield of the rice-plan (1926-1934) the interest rate of land amendment funds decreased and the operational organizations for Land Improvement Projects were repaired. Seventy seven percent of the required amounts of the Land Improvement Project fund accounting for ¥198,197,000 was supposed to be financed with private loans (interest rate of 8.9%) from Dongcheok and Sikeun and from Daejangsung finances (interest rate of 5.9%). However, the total funds of Land Improvement Projects reaching 126,649,470 won was composed of the central government (25%), land amendment low interest fund (63%), and private procurement (12%). The operational organization for Land Improvement Projects expanded the land improvement department

of the Governor General's Office into the irrigation department, the cultivation department, and the land amendment department. By creating land improvement departments and the Chosun land improvement incorporation in Dongcheok, these departments could take an agent role in surveying design, the supervision of construction, and other office duties. The revision of the "Chosun Irrigation Association Ordinances" in 1927 was created to implement the conversion project to paddy fields, readjustment project for arable land, and farming improvement projects, as well as irrigation/drainage and waterproof construction. Moreover, the enactment of the "Chosun Land Amendment Ordinance" made it impossible for landowners with land within the Land Improvement Project areas to raise objections with the implementation of the project. Also union members or operators were not allowed to prosecute a claim for damages caused by the Land Improvement Projects. The legal basis was prepared to support legal restrictions against the land improvement projects conducted by any individuals or groups who were not approved by the irrigation association. The 「Chosun Public Waters Reclamation Ordinance」 was also amended. Since 1930, the financial support for small-scale projects with less than 10 Jeongbos, which was not covered by supplementary regulations on Land Improvement Projects, could be issued to aid up to 50% of the construction costs including funds from both the municipal and central governments. However, as the price of rice plummeted during the Great Depression in 1930, the irrigation association encountered many problems in managing the organization so the business shrunk drastically. In 1931, the Dongcheok Land Improvement department was transferred to the Chosun land improvement incorporation. The Land Improvement department of the Governor General's Office was abolished and the Chosun land improvement incorporation was also closed in July of 1935.

Table 2-1 | The Change Numbers of Irrigation Associations and Beneficial Areas (1908-1927)

Year	The number of associations	Beneficial area	Year	The number of associations	Beneficial area	Year	The number of associations	Beneficial area
1908-1919	17	35,687	1928	126	178,806	1937	216	231,148
1920	24	42,255	1929	149	206,016	1938	226	232,408
1921	35	48,047	1930	176	216,943	1939	245	236,192
1922	46	65,259	1931	189	218,591	1940	300	252,727
1923	52	75,005	1932	192	221,297	1941	373	294,192
1924	58	81,057	1933	194	222,741	1942	432	305,527
1925	70	109,919	1934	190	222,000	1943	483	321,544

Year	The number of associations	Beneficial area	Year	The number of associations	Beneficial area	Year	The number of associations	Beneficial area
1926	81	133,321	1935	190	225,460	1944	595	349,498
1927	107	145,688	1936	190	227,913	1945	598	356,678

Note: 1) Due to their uninitiated projects, Gimpo and Yongdang were excluded from statistic between 1930 – 1935.
2) From the statistics in 1937 and 1938, the part of establishment of the cooperative irrigation association was excluded. By 朝鮮土地改良事業要覽 1939, 190 associations, 229,035 Jeongbo and 189 associations, 230,184 Jeongbo are added.
3) Merged, abolished, and expanded irrigation associations are included.

Sources: 朝鮮總督府農林局,『朝鮮土地改良事業要覽』,'土地改良事業 地目別一覽表' '水利組合一覽表' land development association commission,『10 Years of Korea Land Amendment』, P. 360 (Chang, Siwon, "High-yield rice plan and the changes of agricultural structure," 『Socioeconomic in the Japanese Era 1 (Korean History, 13)』, Hangilsa, 1994).

Such technical support, financial aid, operational organization and agency for the Land Improvement Projects became settled institutionally. On the one hand, local governments actively made efforts to establish the irrigation association, and brought landowners together to strongly recommend the establishment of a union. As a result, the number of irrigation associations skyrocketed. The number of irrigation associations and the beneficial areas increased from 17 associations and 35,687 Jeongbo (1919) to 598 associations and 356,678 Jeongbo (1945) <Table 2-1>. More than half of these associations were established during the increased yield of the rice-plan period.

As can be seen in the number of irrigation associations and beneficial areas by the time of establishment, 17 associations were founded between 1908 and 1919, so the beneficial areas accounted for 35,687 Jeongbo (10% of 1945's beneficial area), 53 associations and 74,232 Jeongbo (21%) between 1920 and 1925 (the 1st plan period), 120 associations and 112,081 Jeongbo (31%) between 1926 and 1934 (the 2nd plan period), 55 associations and 14,192 Jeongbo (4%) between 1935 and 1939, and 353 associations and 120,486 Jeongbo (34%) between 1940 and 1945 (Chosun increased the yield of the rice-plan period). The scale of the beneficial areas by the irrigation associations established during the first and second increased yield of the rice-plan reached 52% of those during the total period of the Japanese colonial era. Moreover, the beneficial areas of the associations founded during the Chosun era increased the yield of the rice-plan including a significant number of finished areas. Given that the size of the completed area was 29,000 Jeongbo, the total irrigated paddy area installed by the irrigation association project during the Japanese colonial era amounted to 265,000 Jeongbo. This estimation refers to the fact that 70% of Land Improvement Projects during the whole period of the Japanese colonial era were carried out during the period of the increased yields of the rice-plan.

After the second increased yield of the rice-plan ended in 1934, the Land Improvement Projects included the following: small scale Land Improvement Projects with less than 10 Jeongbo (50% of construction costs from the central government), a yearly-measure of small scale Land Improvement Projects (15 years after 1937, every 3,500 Jeongbo per year, less than 50% of construction costs for 52,500 Jeongbo by the central government), irrigation/drainage system improvement projects for existing land amendment divisions (20 years after 1937, every 1,500 Jeongbo per year, 20% of construction costs for 30,000 Jeongbo by the central government), facility renovations and additional construction of the existing land amendment divisions (20-50% of construction costs by the central government), the establishment of cooperative irrigation associations of which irrigation works for the beneficial area less than 200ha with responsibility for the associations without the central government (57 associations established between 1937 and 1939). The first three points mentioned previously were composed of Chosun increased yields of the rice-plan in 1940 and they continued to be conducted.

Five years after the increased yield of the rice-plan was cancelled, the Japanese imperialists established the 'Chosun increased yield of the rice-plan' again in 1939 for the purpose of increasing rice production. The plan initially ruled out the Land Improvement Projects but focusing on the improvements of the laws of agronomy and breeding. However, they modified the plan to increase the amount of production up to 6,800,000-seok, which was planned to be achieved through the improvement of agronomy laws (75%) and land amendments (25%). Land Improvement Projects continued to implement annual relief for the Land Improvement Projects in 1939. According to the immediate production effects, saving materials (steel in particular), and annual measures, cultivation/reclamation/subsurface drainage were sometimes excluded or passively conducted, rather than focusing on irrigation enhancement for maintaining the paddy. The amount of rice production was increased up to 21,530,000-seok (1940) and 24,890,000-seok (1941), while in 1939 the amount was only 14,360,000-seok due to severe droughts. Still, they remained at 85% (1940) and 96% (1941) of the planned goal.

While Chosun increased the yield of the rice-plan, it did not achieve the goal of the planned amount, and even worse, Japan did not produce a big harvest of rice in 1941. Due to the outbreak of the Pacific War in December 1941, Japan ensured that Chosun increased the yield of the rice-revision plan, which was expanded from the previous plan. Chosun increased the yield of the rice-revision plan and noted that some points were similar to Chosun's increasing yields in the rice-plan. First of all, as the most prominent feature, the goal of the rice production amount was revised from 25% to 54%. Secondly, with regard to the content of the Land Improvement Projects, irrigation enhancement was highlighted, as in the past, but the largest expansion occurred on the arable land expansion project such

as the cultivation, conversion, and the reclamation of land categories, which constituted 27% of the entire business. Thirdly, the Chosun farmland development organization was created to further reinforce the Land Improvement Projects. Unlike the Land Improvement Projects of irrigation associations, if the Chosun Governor General's Office approved the development of agriculture, then the development projects would be able to be enforced without asking for the consent of the landowners in the project areas. Fourthly, taking the rise of inflation and wages into consideration, the supplementary regulations for Land Improvement Projects were revised and expanded the rates of the subsidies.

Despite ambitious plans, the Land Improvement Projects became sluggish due to the prolonged war and the lack of materials, the labor force, fertilizer and other production materials. To make things worse, since 1941, rice production significantly reduced due to continuous natural disasters every year. The target production ratio compared to the actual production was 58.7% in 1942, 68.4% in 1943, and only 59% in 1944.

The outcomes of the Land Improvement Projects in the Japanese colonial era are indicated in <Table 2-2>. Land Improvement Projects in 1910 were mainly focused on the renovation of existing reservoirs and weirs. On the other hand, during the period of increasing yields of rice-plans of the 1920's, it focused on irrigation enhancements by establishing the irrigation association through farmland developments such as cultivation, reclamation, and conversion of land categories. In the 1940's the Farmland Consolidation Project was firstly carried out and places for transportation were constructed.

Table 2-2 | The Implementation Area and the Rate of Subsidies of Land Improvement Projects by Increasing the Yields of Rice-Plans During the Japanese Colonial Era

(Unit: Jeongbo, %)

		Increased yield of rice-plan		Chosun increased yield of rice-plan	
		The 1st plan	The 2nd plan	Chosun increased yield of rice-plan	Chosun increased yield of rice-revision plan
Project period		1920-1934	1926-1939	6 years after 1940 (8-year completion)	12 years after 1940 (14-year completion)
Implementation area (Jeongbo)	Total area	427,500	350,000	163,000	577,700
	Irrigation enhancement - large division (more than 200 Jeongbo) - small division (less than 200 Jeongbo)	225,000	195,00 165,000 30,000	101,000	307,000
	Conversion of land category	112,500			

		Increased yield of rice-plan		Chosun increased yield of rice-plan	
		The 1st plan	The 2nd plan	Chosun increased yield of rice-plan	Chosun increased yield of rice-revision plan
Implementation area (Jeongbo)	Cultivation	90,000			
	Reclamation	-	33,050	-	32,000
	Cultivation/conversion of land category			25,400	126,700
	Farmland consolidation			18,000	66,000
	Subsurface drainage			6,000	22,000
	Small scale land amendment			12,000	24,000
Rate of subsidies (%)	Irrigation enhancement - large division - small division	less than 20	less than 20	 50 50	 55 50
	Conversion of land category	less than 25	less than 25		
	Cultivation	less than 30	less than 30		
	Reclamation	less than 30	less than 30 (changed to 50 since 1929)		½ 55 ½ 50
	Cultivation/conversion of land category - large division - small division - conversion to paddy field			 50 50 30	 55 50 30
	Farmland consolidation			30	
	Subsurface drainage			30	
	Small scale land amendment			National expense 50, local expense 25	National expense 50, local expense 25

Table 2-3 | The Total Outcomes of Land Improvement Projects during the Japanese Colonial Ara (based on area completed)

(Area Unit: ha)

Projects	Total		1908-19		1920-39		1940-45	
	Number of divisions	Area	Number of divisions	Area	Number of divisions	Area	Number of divisions	Area
• Irrigation enhancement	478	335,515	15	40,863	294	191,258	168	103,394
- irrigation association	357	247,675	15	40,863	173	177,810	168	29,002[1]
- joint	64	7,391	-	-	64	7,391	-	-
- cooperative irrigation association	57	6,057	-	-	57	6,057	-	-
- small scale		74,392	-	-				74,392[2]
• Farmland development	302	53,596			302	53,596	-	-
- conversion of land category	73	12,314			73	12,314		
- cultivation	39	7,623			39	7,623		
- reclamation	190	33,659			190	33,659		
• Farmland consolidation (association division)		24,000						24,000
• A year project division	16,944	56,737			16,944	56,737		
• Renovation (reservoir, beam)	1,937	50,400	1,937	50,400	-	-		
Total	19,661	520,248	1,952	91,263	17,540	301,591	168	127,394

Note: 1) Incomplete construction (93 divisions, 100,019ha) was excluded at the time of Korea's independence from Japan in 1945.

2) Between 1943-1945, urgent small projects (about 200,000ha in total, 70,000ha completed, 130,000ha incomplete, 60,000ha failed, 71 divisions of the total with 4,392ha financed by 50% (national funds 25%, local funds 25%) (1940-42)

Sources: Ahn, Jaesook, 『Hankuk Farmland Gabalsa』, 1989, p.73

2.2. 1950's Agricultural Production Infrastructure Improvement

Since Korea gained its independence in August, 1945, there were 425 associations and 188,167ha of beneficial areas (443ha, average per association) in South Korea and 173 associations and beneficial areas of 168,511ha (974ha, average per association) in North Korea. The scale of irrigation associations in South Korea was small. With regard to the size of scale, the total number of both Koreas was 598 associations and 356,678ha of beneficial areas. Of these, the number of associations with less than 300ha of beneficial areas was 464 and the beneficial area was 64,731ha. This constituted 77.6% of the total number of associations but in terms of the beneficial area there was only 18.1%. The beneficial area for the 11 associations with more than 5,000ha was 45.5% of the total with 162,282ha.

Entering South Korea, the U.S. military arranged an administrative organization related to the Land Improvement Projects. The U.S. started to finish uncompleted Land Improvement Projects in order to revive the functions of the established regulations and operational organizations created by Japan. In September, 1945, the U.S. military created a land amendment department under the Department of Agriculture and the Agricultural Bureau for each province. In October and December, 1945, the Chosun farmland development and the Chosun irrigation association were reinstated. Moreover, the laws and regulations enacted by Japan were applied with necessary modifications, such as the Chosun Irrigation Association Act, the Chosun Land Amendment Act, and the Chosun Farmland Development Act. However, the operational system improved by the founding irrigation association first by the Chosun farmland development and then after, obtaining approval from the landowners in the project areas. The creation of the irrigation associations and the part of the reclamation project, which had been carried out by Chosun farmland development, were initiated and these projects were conducted in 122 divisions over 51,039ha. The completed projects came to 1,236ha and approximately 70,000ha were discontinued and abandoned.

Since the establishment of the Government of the Republic of Korea in August 1948, several small and large division installation projects (i.e., construction of reservoirs and weirs, other reclamation projects, sub-farmland construction projects) were initiated with funding for equipment material aids from the ECA (Economic Cooperation Administration). As the irrigation association became the main project operator in 1948 and 1949, small and large division installation projects and reclamation projects were initiated with 163 divisions of 63,274ha and then 66 divisions of 14,899ha were completed. With regard to the sub-farmland construction project, facility renovation projects with 94 divisions of 29,869ha were implemented. Right after Korea gained independence in 1945, 425 associations and beneficial areas of 188,167ha increased to 458 associations and beneficial areas of 224,399ha. In spite of the sharp reductions in union dues, the irrigation association faced a financial crisis due to the accumulated arrears of union dues. Due to inflation, union dues per weir increased drastically by 26 times from 17.87 won (1945) to 465.55 won (1948). Nevertheless, the value of union dues, after being converted into the spot price, was 0.05 seok (2% of the net amount of harvest) between 1945 and 1947 and 0.08 seok (3% of the net amount of harvest) in 1948. Compared to the amount of harvest (10%-20%) during the Japanese colonial period, there had been significant reductions in the value. In spite of this, the main reasons for the arrears of union dues resulted from the delayed payment of rice collection and the arrears of union dues by sub-farmland tenants under the Shinhan operator.

Because of the aftermath of the outbreak of the Korean War on June 25, 1950, the recovery of greatly damaged hydraulic facilities became urgent. The funding for projects was secured through the expansion of central government through a temporary land

revenue tax, the Special Accounts for Farmland Renovation Projects, the Special Accounts for Economic Rehabilitation, and issuing long-term bonds. The irrigation associations surged and small and large division installation projects increased drastically. In December, 1951, with temporary land revenue taxes of 176 billion won (146 billion won from central government, 30 billion from long-term bonds) of supplementary budget, the small and large division installation projects, reclamation, farmland conservation, and flood prevention measures resumed for 168 divisions and the irrigation safety embankments with 4,376ha of 17 divisions were constructed. As the Acts on the Special Accounts for Farmland Renovation Project was enacted on March, 1952, the Farmland improvement project was initiated. Then in 1953, the first agricultural high-yield five-year plan was initiated. Since July, 1953, aid from the UNKRA (United Nations Korean Reconstruction Agency) for five-year farmland improvement projects could recover from the war damage and expand the Farmland improvement project. In December 1953, the Korea Development Bank Act was established. In March 1954, the Act on the Special Accounts for Economic Rehabilitation was also established so that the industry revival bonds fund and supplementary funds were committed into the Farmland improvement project. Additionally, materials and equipment, such as cement, gun powder, steel, and heavy equipment, were provided by the ECA (1950), UNKRA (1953-1954), the FOA (Foreign Operation Administration, 1955), and the ICA (International Cooperation Administration, 1956-1959).

The irrigation association and its beneficial area had increased from 442 associations with 195,656ha (1950) to 684 associations with 325,180ha (1959). The irrigation association construction project increased from 247 divisions with 103,378ha (1952) to a construction area of up to 100,000-130,000ha until 1957. At the end of 1957, the project which had already started was supposed to be completed by 1958 and new construction was suspended and redirected. Since 1952, the cash payment for union dues was modified to become payment in cash or in kind. Ten percent of the delinquent union dues were charged as late fees to improve the payment rate. However, the finance association still faced deficits because the increased rate of grain prices was too low compared to the rate of inflation. In 1952 and 1953 the value of union dues converted into the spot price increased to 0.11-seok (4% of the net amount of harvest). After 1954, there was a significant increase to 0.21-seok (7% of the net amount of harvest, 13% of the amount of increment). Specifically, since September 1958, the annual installment of long-term bonds redemption and disaster recovery construction costs was imposed on the basis of union dues. The converted price of grain for the payment in kind for union dues was modified to apply to the lower government sales price, which was lower than the market price until 1960.

Table 2-4 | The Development of Irrigation Association Dues in the 1950's (1954-1960)

Year	Union Dues			The Amount Of Harvest (Seok)			Ratio Of Union Dues (%)	
	Union Dues (Hwan)	Union Dues (Seok)	1seok Price (Hwan)	Before	After	Increment Rate	Comparison to the Amount of Harvest	Comparison to the Increment Rate
1954	709	0.21	3,360	1.39	2.95	1.56	7	13
1955	1,620	0.21	7,530	1.47	3.10	1.63	7	13
1957	2,100	0.15	13,630	1.48	3.27	1.78	5	8
1958	2,750	0.24	11,230	1.56	3.63	2.07	7	12
1959	3,000	0.30	9,910	1.54	3.48	1.94	9	15
1960	2,610	0.22	11,720	1.53	3.61	2.08	6	11

Source: Union of Land Improvement Associations (ULIA), 『Land Improvement Projects 20 Years』, 1967, page. 242

Table 2-5 | 1950's Outcomes of Agricultural Infrastructure Improvement Projects (1946-1959)

(Unit: ha, 1,000 won, %)

Period	Projects	Number of Divisions	Beneficial Area	Project Cost		Note
				Value Amount	Component Ratio (%)	
Total		7,374	1,030,634	9,728,745		
1946-1949	Subtotal	74	32,823	6,936	100.0	
	Agricultural water development	69	15,520	6,361	91.7	1946-49
	Reclamation	5	236	497	7.2	1946-49
	Hydraulic facility renovation		17,067	78	0.1	1948-49
1950-1959	Subtotal	7,300	997,811	9,721,809	100.0	
	Agricultural water development	4,691	158,306	7,848,052	80.7	
	Agricultural association	319	79,313	7,402,910	76.1	1950-59
	Small scale	4,372	78,313	445,142	4.6	1957-59
	reclamation	20	3,419	609,050	6.3	1950-59

Period	Projects	Number of Divisions	Beneficial Area	Project Cost		Note
				Value Amount	Component Ratio (%)	
1950-1959	Hydraulic facility renovation	1,378	579,820	826,936	8.5	1950-59
	Disaster recovery	822	197,210	303,730	3.1	1950-59
	Cultivation		2,514	43,934	0.5	1957-58
	Farmland conservation	286	26,744	53,446	0.5	1952-55
	Sub farmland construction	103	29,798	36,661	0.4	1951-54

Sources: Korea Rural Economic Institute Compilation, 「Korean Agricultural Administration History of 50 Years (Vol. 1)」, Ministry of Agriculture and Forestry, p.133

2.3. Background of the Implementation of the Farmland Consolidation Project in the late 1960's

As can be seen earlier, for about 20 years since Korea gained independence, in the mid-1960's, agricultural infrastructure projects had solely focused on irrigation and drainage to overcome droughts and floods, rather than on the maintenance of production infrastructures through farmland consolidation. From the farmer's perspective, the damage from droughts and floods were the most critical aspects. But, due to farmland consolidation, they did not want the farmland inherited from their ancestors to be small and different in shape. The farmland consolidation project was not what farmers wanted.

It has been known that the first Farmland Consolidation Project in the 1960's were initiated as Gyeongsangbuk-do established the 'Advanced Gyeongsangbuk-do Fundamental Plan', of which the core project was the implementation of the Farmland Consolidation Project. Gyeongsangbuk-do initiated the project for 247 divisions of 5,806ha from the spring of 1964. At that time, there was no accumulated knowledge about farmland consolidation technology or any replotting experience. The project cost was also partially supported using only materials from local government, but most of the cost was paid by the farmers. The project cost was imposed proportionately depending on the owned farmland size and additional people per 10a were limited to a maximum of 11 people. The cost was only for supporting material expenses used for bridges or culverts. This project was conducted within a very short period of time under fierce opposition from the farmers. Nevertheless, after the construction, the farmers reacted to the project in a positive way in that the transplanting of rice became more convenient because of the readjusted farmland division. Also, double

cropping was possible because the farm road and irrigation and drainage canals were constructed (Rural Development Corporation (RDC),『Comprehensive Bibliography on the Agricultural Infrastructure Project』, 1999, pp.554-555).

The Farmland Consolidation Project in Gyeongsangbuk-do was the central government's main project in 1965. The president publicly announced the national implementation of the Farmland Consolidation Project during his annual state of the nation message in 1965. In February of the same year, the president did a spot inspection at farmland consolidation areas and he ordered a national level of expansion of the Farmland Consolidation Project. Then in 1965 the project was conducted around the country as a national project by the central government.

Since 1965 the Farmland Consolidation Project was adopted as the central government's project. The background of the introduction and sustained implementation of the project was that there was demand for farming machinery and its distribution. In the 1950's, there were abundant labor forces so that the demand for the mechanization of farming works was very low and motor-powered agricultural machines were not widely distributed. The government prepared for a plan of distributing farming equipment in 1958, so the government introduced the financial aid system from agricultural banks to support the purchase of farming machinery. Moreover, motor-powered agricultural machines developed in Japan, were introduced by civilians but the introduced number of machines was negligible. According to the status of the obtained number of farming equipment in 1960, with regard to the motor-powered agricultural machine, there were 3,000 motor-powered grain threshing machines, 2,000 water pumps, 15,000 rice huskers, and 25,000 rice milling machines. With regard to human resource farming equipment, there were 20,000 pest controllers, 200,000 grain threshing machines, 30,000 foot threshers, 25,000 rice straw-mat-making machines, and 20,000 radiators were also distributed. Since then, the power tiller began to be distributed in 1961 (40), 1964 (360), and 1967 (2,160). The tractor was firstly introduced in 1967 (202), and the motor sprayer was introduced in 1969 (2,000). Around 1965 the power tiller began to be distributed. Therefore, although the farming machinery was starting to spread, this did not necessarily mean that farmland consolidation was needed. However, the need for the distribution of farm machinery had been strongly raised. On that basis, the Farmland Consolidation Project could be led by the government.

2012 Modularization of Korea's Development Experience
Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

Chapter 3

The Development Process of the Farmland Consolidation Project

1. The Local Government-Oriented Farmland Consolidation Project (in the late 1960's)
2. Increased Demand of Farmland Consolidation and Improvements of the Legal Systems (1970's)
3. The Modernization of Readjustment Projects for Arable Land for the Improvements of Agricultural Structures (Since 1990)
4. The Overall Transition of the Farmland Consolidation Project

The Development Process of the Farmland Consolidation Project

1. The Local Government-Oriented Farmland Consolidation Project (in the late 1960's)

1.1. Gyeongsangbuk-do's Attempt at the Farmland Consolidation Project

The Farmland Consolidation Project which had not been implemented for the last 20 years since Korea gained independence was finally implemented in Gyeongsangbuk-do for the first time in 1964. Gyeongsangbuk-do established the 'Advanced Gyeongsangbuk-do Fundamental Plan' in 1964 "in order for the rationalization and modernization of agriculture by mobilizing human and material resources to the extent possible and for the rapid development of the industry". The framework for the project at that time can be referenced from the Gyeongsangbuk-do Governor's article (Kim, In, "New Year's municipal administrative index of our Do: for the case of Gyeongsangbuk-do", Korea Local Administration Officials' Mutual Fund, 『Local Administration』 Vol. 13, 123, 1964, pp.49-53).

The 'Advanced Gyeongsangbuk-do Fundamental Plan' was divided into six divisions according to the characteristics of Gyeongsangbuk-do and the Development Promotion Committee was established to set "the primary goal of the improvement of characteristics and cultural life and of the modernization of the rural areas". The detailed goals were as follows: ① strengthening of agricultural technology education, ② hydraulic facility expansion, ③ erosion control works, ④ road maintenance, repair and development, ⑤ expansion of port facilities, ⑥ the improvement of social life. In order to foster increased agricultural technical guidance, 335 agricultural technical personnel were mobilized to be placed in the

agricultural extension office, and a farmers headquarters was installed in every village to train 11,300 agricultural leaders (one male and one female from each village) who could lead their villages toward rural modernization. As the hydraulic facility expansion planned to create 13,000 Jeongbo irrigational weirs, 37 land amendment association divisions and 360 small-scale irrigational work divisions needed to be completed. An increase of 35,000 seok of grain would be created through the of arable but abandoned lands of 7,100 Jeongbo.

Additionally, the measures of basic policies were as follows: ① the modernization of farming and fishing villages, the mechanization of rural and public demonstrations of technological improvement based on the standard farms in villages and farmer headquarters in city/eup/myeon, ② the formation of major production areas and full time farming families by produce, and the transfer from rice-oriented single extensive agriculture to profitable cash crop- based full time farming, ③ the efficient operation of agricultural development committees for implementing give-and-take and division-and-junction of land, ④ the great expansion of farmland by the step-by-step cultivation of abandoned land and mountainous sloped areas, ⑤ agronomy technical training of agricultural technicians as a base for facilitating the development of improved farming techniques, ⑥ the development of public sectors through taking into account regional characteristics and the socioeconomical common interests, ⑦ the land conservation and the comprehensive implementation of irrigation works, and ⑧ the active development and promotion of mining industries and the expansion and maintenance of social life environments and facilities.

As a core project of the 'Advanced Gyeongsangbuk-do Fundamental Plan', Gyeongsangbuk-do had initiated the Farmland Consolidation Project since the spring of 1964. The administrative office of Gyeongsangbuk-do collected and published an article ("The Outlook of Gyeongsangbuk-do Farmland Consolidation Project", 『Local Administration』 vol. 137, 1965, pp.165-175). According to this paper, based on the implementation of farmland consolidation with the standard of 20ha per division in 250 divisions every year, the area for farmland consolidation was 5,700 Jeongbo (1964), and the total of 20,700 Jeongbo was planned and annually 5,000 Jeongbo for three years between 1965 and 1967. The size per division was 0.2-0.3ha, and the width of the road was spacious enough for carts to pass the road, and the distribution density was about 150-250m/ha, and the irrigation/drainage canal should have been separated, and the replotting to groupings was based on the consolidation of farmland through the exact land assessment. Also a preliminary step toward the Farmland Consolidation Project, the chief officer of "eup" and "myeon" should have been educated on the concept of farmland consolidation. Then, the next step would be to train the construction managers in the cities or "guns". Approximately 500 people were supposed to receive practical training for five days, including chief construction officer in cities and "guns", technical and intellectual trainees,

and technicians for the land amendment association. The main operators of farmland consolidation were land amendment associations (50 divisions implemented in 1964) and land amendment departments (197 divisions implemented in 1964). The final decision of the farmland consolidation included confirmed measurements and replotting. The 13 surveyors would include a conclusion survey and 13 measurement agents would be assigned and 28 geographical technicians would be mobilized to receive training for two months. They were assigned to three conclusion survey classes with seven to eight students per class to conduct measurements. The disposal of replotting was assigned to municipal officers to address the replotting office works for saving expenses.

Thus, the farmland consolidation of 5,806 Jeongbo from 247 divisions was carried out in 1964. According to the result of farmland consolidation, the reduction rate of the lot was 1.45%, which was decreased by 84.3 Jeongbo. The total amount of investment in the project cost was 47,984,976 won including national funding of 1,077,000 won (2.2%), local government funding of 46,907,970 won (97.8%), a calculated amount of the effort burden of 1,049,281 won (2.2%), and there was a calculated labor relief construction of 2,199,465 won (4.6%). The majority of the funding was from the local government.

The Gyeongsangbuk-do administration pointed out the problems of readjustment projects of arable land as follows: firstly, the lack of awareness of some of the farmers, who had no experience in the business, meant that they did not understand the importance of the ancestral state of the inherited farmland. Secondly, sufficient basic data on natural conditions and a lack of experience and, as a matter of planning standards, regional/economic/reasonable planning standards were to be taken into consideration. Thirdly, with regard to legal matters, in the case that the land amendment association implemented the land Farmland Consolidation Project, considering that the shape and ownership relations of the target divisions might vary, there were no regulations on the procedures, nor had any provisions been implemented on the coordination of farmland consolidation after the taxes were calculated on the amount of harvest (rental price). Even if there were tax reductions/exemptions/delays on Land Improvement Projects, it would be so confusing compared to other tax rules and would hence make it harder to operate the projects. Also due to the complicated registration process, it took a lot of time to address this issue. Fourthly, when the land amendment department conducted the Farmland Consolidation Project as joint projects, the implementation process was too complex and the driving force was negligible. Fifth, absentee landowners were too passive to promote the projects. Sixth, it was difficult to secure financial resources and the central government was not proactive, which made the projects too challenging to carry out and it was difficult to sustain the projects with the local government. Seventh, readjustment projects of arable land were needed for agriculture civil engineers and replotting technicians, but in reality they lacked human resources.

The cases of Gyeongsangbuk-do readjustment projects of arable land can be explained in the record written by a section chief of the construction division in Geumreung-gun (presently Gimcheon) (Woo, Hacheon, "Experience on farmland consolidation", Daehan Local Administration Mutual Aid Association, 『Local Administration』 Vol. 14, 137, 1965, pp.74-84). As one of the core elements of agricultural modernization in the 'Advanced Gyeongsangbuk-do Plan', the farmland consolidation construction was carried out by Geumreung-gun in two divisions with 161 Jeongbo (spring, 1964) and six divisions with 601 Jeongbo (autumn). The total of eight divisions with 768 Jeongbo were constructed. Mr. Woo did not have enough time to prepare for the farmland consolidation but he took responsibility to manage the practical functions on farmland consolidation in February, 1964. Then, on March 2nd, he hired two assistants to conduct the surveying design with limited experience in agricultural civil engineering. He felt like an unlicensed doctor entering an operating room, but was confident in his medical practice, even though he had very limited experience. Mr. Woo's experiences can be summarized as follows.

In Geumreung-gun, Jung-wang-dong, Eomo-myeon, on March 23, 1964, the Farmland Consolidation Project for farmland with 77.9ha was initiated. Later on, then, on March 31st, in Sinchon-dong, Nongso-myeon, 83.5 of farmland was completed on June 5 and 21ha for the Farmland Consolidation Project for construction in the fall, October 21 Chogok-dong, Nam-myeon 52.2ha of farmland endured a Farmland Consolidation Project, which led to the construction of six districts of farmland. The 601 Jeongbo Farmland Consolidation Project for the construction was completed on December 20, 1964. The target areas of farmland consolidation were 43% of the entire paddy area of Geumreung-gun which was distributed in Cheonjeongcheon, Gamcheon and its tributaries from the transportation options. The expected promotion also effected larger railways, roadsides of large districts, and the first selected was thus "skeptical about the effects of the business farmers who volunteered to work, and whose cooperation increased over time" he said.

The Farmland Consolidation Project in Geumreung-gun was conducted under several complications. The first one related to the fact that there were no human resources with technical knowledge and experience about agricultural civil engineering and replotting in farmland consolidation. The main agent of the project of the Farmland Consolidation Project was the land amendment association and the land amendment department but Geumreung-gun established the land amendment department as the farmers' joint business and managed to conduct the project. All other office administrators including surveying, measurement, design, supervision, and implementation were responsible for reporting to the local government office. There was a severe lack of technical human resources related to farmland consolidation.

The second reason is that only material expenses were supported by local government expenses as project cost funding but the majority of the construction expenses was the farmers responsibility. Due to the principle indicating that the construction cost should be proportionate to the land area owned by the farmer, the chief of the land amendment department was responsible for collecting expenses. To avoid too much burden from farmers, there was a requirement not to exceed 11 people at the most per danbo. The material expenses related to the construction of bridges to connect between farm roads and irrigation/drainage canals were aided from the budget. Thus, there were 17,700 people involved in labor attendants annually and the grants were valued at 1,727,000 won.

Thirdly, the employees under the head of a Gun should put significant effort into garnering consent and cooperation on the readjustment projects of arable land from farmers. For promoting farmland consolidation, target areas were selected where there would be easy and convenient access to transportation such as railroads and road sides. Also successful opening ceremonies could be one of the promotional methods of farmland consolidation. Furthermore, "since the opening ceremony the military officers visited the site by taking turns to encourage the farmers and to persuade them to realize the importance of the project". The estimated project is installed within a large tent, as is the head of a Gun. All farmers were very impressed by watching them live in the building.

Table 3-1 | Summary of the Farmland Consolidation of Geumreung-gun, Gyeongsangbuk-do in 1964

(Unit: ha, People)

Name	Location	Area	Number of beneficiary	Initiation	Completion
Total	8	761.5	1,464		
Sinchon	Sinchon-dong, Nongso-myeon	83.5	140	March 31, 1964	June 5, 1964
Jung-wang	Jungwang-dong, Eomo-myeon	77.9	223	March 3, 1964	June 21, 1964
Wonchang	Ui-dong, Apo-myeon	189.3	327	November 3, 1964	December 20, 1964
Wolgok	Wolgok-dong, Nongso-myeon	118.0	225	October 27, 1964	December 20, 1964
Saedeul	Chogok-dong, Nam-myeon	52.2	107	October 21, 1964	December 20, 1964
Daepyeong	Sinan-dong, Joma-myeon	114.3	208	October 31, 1964	December 20, 1964

Name	Location	Area	Number of beneficiary	Initiation	Completion
Danam	Danam-dong, Eomo-myeon	82.6	159	November 9, 1964	December 20, 1964
Gwang myeong	Gwangmyeong-dong, Guseong-myeon	43.7	75	November 7, 1964	December 20, 1964

Sources: Woo, Hacheon, "Experience on farmland consolidation", Daehan Local Administration Mutual Aid Association, 『Local Administration』 Vol. 14, 137, 1965, pp.74-84)

The project of Geumreung-gun was conducted hopelessly within a very short period of time despite the opposition from the farmers. Nevertheless, after the construction, the farmers reacted to the project in a positive way because they realized that rice transplanting became more convenient because of the readjusted farmland division. There had been severe spring rains in the spring in 1964 and because of this, most of the farmers blamed God. However, of the two divisions, the double-cropped paddy accounted for 28%. Due to the drainage canal, "Even if there has been boring rains, irrigation performed well and I could see the fresh growth of barley. The Farmland Consolidation Project was praised to be one of the measures to be conducted with priority". The positive effects of the project were acknowledged and instilled a lot of confidence in the implementation of the project. Also it was convenient for farmers to perform rice transplanting because of the neatly arrangement of farmland. Because of farm roads and irrigation, single cropping was updated into double cropping and the farmers were satisfied with this process. The total size of rural roads in Geumreung-gun in 1964 increased by 14.1ha while the farmland size decreased by 19.2ha. However, the size of double cropping areas increased by 472.6ha. Farmland in Cheonjeongcheon was of low humidity so that it was impossible to complete cropping after the rice harvest. Despite this, it became a priority to make double cropping possible during the Farmland Consolidation Project.

Table 3-2 | The Size Comparisons of Areas in Geumreung-gun, Gyeongsangbuk-do before and after the Farmland Consolidation Project (1964)

(Unit: ha)

	Total	Farmland			Rural Road	Furrow	Irrigation/ Drainage Canal
		Subtotal	Single Cropping	Double Cropping			
Before	761.5	728.2	597.1	131.1	6.3	27.0	-
After	761.5	709.0	105.3	603.7	20.4	-	32.1
Increment	-	19.2	491.8	-472.6	-14.1	27.0	-32.1

Sources: Woo, Hacheon, "Experience on farmland consolidation", Daehan Local Administration Mutual Aid Association, 『Local Administration』 Vol. 14, 137, 1965, pp.83.).

Since 1965, the Geumreung-gun's administrative powers of the local government and the readjustment projects of arable land of Gyeongsangbuk-do adopted the central government's plan. In the Presidential State of the Union address in 1965, it was indicated that the Farmland Consolidation Project of Gyeongsangbuk-do would be expanded nationwide. Moreover, right before the first provincial minister's meeting, which had been scheduled at the Gyeongsangbuk-do office building for February 13, President Park Chung-hee visited the farmland consolidation sites including the Sinan plains, Joma-myeon, Geumreung-gun, the Wolgok/Sinchon plains, Nongso-myeon, and the Chogok plains. Nam-myeon accompanied the Prime Minister, the Minister, and the Governor from each part. During the meeting, President Park ordered the Farmland Consolidation Project to be expanded nationwide after 1965. After that, the work site of the farmland consolidation at Geumreung-gun was full of visitors from various fields and a number of the farmers' representatives and practitioners every day.

With regard to the beneficiary's participation and cooperative process and the administrative efforts for the Farmland Consolidation Project, the case of Sangju-gun describes it in detail (Lee, Insang "the case study of agricultural readjustment projects of the arable land at Seongdong district, Sangju-eup, Sangju-gun", Korea Local Administration Mutual Aid Association, 『Local Administration』 Vol.14, 144, 1965, pp.196-204). Sangju-gun initiated the farmland consolidation project to consolidate farmland with 147 lots of 82,000 pyeong (27.1ha) into the farmland with 143 lots of 80m x 25m (606 pyeong) on November 2, 1964. and the project was completed on December 22 that same year. The total budget for the project was 255,000 won including operational expenses of 235,000 won (local government expenses were 115,000 won, 49%) to pay for wages and heavy equipment usage, implementation expenses of 20,000 won to pay for gas, poles, and straw nets. The human resources committed to the project consisted of 4,540 people, which included people from neighboring villages, who worked about two hours per day, and administrative military officials and even students from Sangju Agricultural High school.

Prior to the Farmland Consolidation Project, the farmland at Seongdong district, Sangju-eup, and Sangju-gun, had used levees to pass by due to the fact that there was no rural road. After the sowing of rice seedlings, the passage was closed which caused difficulties in crossing, and caused quarrels due to the collapse of the levee.

Moreover, due to the lack of water-ways, irrigation had been completed between rice paddies. When there was insufficient water, there were disputes between the farmers. Irrigation usually took a lot of time and the irrigation/drainage works could not be completed at the same time. It was also difficult to conduct double cropping because there was no drainage canal. Moreover, farmland was scattered in several places so that the time of the labor forces was wasted. Therefore, labor productivity was noticeably low.

Before the Farmland Consolidation Project, Seongdong-dong residents among 98 farmland planters of the Seongdong district included only 38 people (38.8%). The other 60 were distributed in 15 other dongs, so the project operators had difficulties facilitating the meetings convened for business promotions and understanding concessions. The challenges Sang-ju-gun would face during the Farmland Consolidation Project are ① the problems around the farmers' voluntary participation in the Farmland Consolidation Project, ② the problems related to working efficiently during the Farmland Consolidation Project, and ③ the problems related to the replotting of multiple ownership lands. These problems can be solved and addressed by the town mayor and a dong leader, which can be summarized as follows:

First, in order for the farmers to voluntarily participate in the Farmland Consolidation Project, the town mayor and a dong leader persuaded the farmers numerous times then tried to form public opinion to elicit a consensus. Initially the town mayor and the dong leader were able to gather 11 people out of 98, who had large farmland and could lead to the formation of the public opinion. Then they opened a roundtable to discuss farming methods and agriculture in developed countries such as Japan. Also they discussed the current status of the Seondong district's farm road and the irrigation/drainage canal and farmland consolidation. In the second meeting, they reopened a roundtable with the same 11 members to share ideas about the benefits in improvements to Seongdong district's farmland and the possibilities for improvement. In the third meeting with the same 11 members, after discussing ways to improve farmland conditions in Seongdong district, they were determined to improve the current situation for the next generation. Then, with support of the town mayor, the dong leader urged the farmers to implement the readjustment project and five people strongly agreed, four were undecided, and two disagreed. Both the town mayor and the dong leader each tried to persuade the two people who disagreed. After asking them why they disagreed, both mentioned the topsoil of their farmland was so thin that it would be useless if the topsoil was removed. The dong leader told them how to move the topsoil and, if they wanted, the land could be exchanged. Nevertheless, the two farmers continued to disagree on the project. The dong leader and the town mayor continued to persuade the two farmers and finally, the they agreed to the project and agreed to take on roles to facilitate farmland consolidation. During the fourth and final meeting, all 11 people reached a consensus on implementing the Farmland Consolidation Project and they were then dismissed. Later on, those 11 people led the promotion and formed public opinion about farmland consolidation, and organized the Sengdong district land amendment department. They agreed to form the general assembly and committee for replotting.

Secondly, for the purpose of passionate work and an efficient construction process, it was suggested that the content of the project be opened and that it be revealed to the public.

Hearing the opinion of the residents and being evaluated, the dong leader and the town mayor devoted themselves to solve the problem and encouraged the project and worked in consultation with the officers. The town mayor always attended the meeting, showed up at the working site in the morning, directed the work, and allowed the senior workers to take a break. The town mayor spent about 4 hours at the work site every day. The dong leader also encouraged workers at the site. At night, he analyzed the working plan and reviewed the project plan by meeting with officers. When it came to difficult problems, he tried to find experts at county or town halls to find a resolution and he was given the nickname 'Dr. Farmland consolidation' by the residents. In addition, the residents only took human resources into consideration for work. However, the town mayor relentlessly requested bulldozers from other areas for three days. Finally, he successfully brought a bulldozer into the projects, to avoid wasting the workers' efforts and to increase the operational efficiency as well as worker morale. The increase of the construction costs due to the use of heavy equipment was compromised and was eased by the assistance of the military, so the opposition from the residents was alleviated.

Thirdly, replotting is the most challenging issue in farmland consolidation. A strategy to get a unanimous vote from the General Assembly was conceived and the strategy tried to solve the replotting problems and to achieve the replotting of multiple ownership lands. However, at the end of site visit, four members disagreed. Through endless persuading and concessions, they finally agreed so that farmland consolidation and grouping farmland could be achieved successfully. The town mayor, the dong leader, and five replotting committee members established the plan. However, it was expected that there might be a gain and loss and possible complaints and opposition. Failing to find out a solution, the General Assembly made a suggestion to obtain a unanimous vote. The final decision on replotting needed not only to obtain a resolution of the General Assembly, but also to obtain approval from each individual. Thus, the General Assembly convened, and then the replotting members and a dong leader tried to make a replotting plan, but were not able to satisfy all the full planters. Some people would not make any concessions, as they could not afford a loss. If not, they said they would resign from their positions and submitted a letter of resignation. After a few minutes of silence, the resignation was withdrawn and it was announced to that the replotting plan would be made open to the public and many people agreed on this idea. The town mayor also urged to dismiss the notice of resignation. Then the resignation was withdrawn and the replotting plan was presented. Now the other four members returning from the site visits rigorously raised objections to the replotting plan. After the town mayor and the dong leader persistently begged, only one person changed to agree. The other 3 were adamantly opposed. One of the three agreed to the replotting plan because there was a person who would replace his or her. Another person requested a change from the land of an owner whose land was located nearby. Even though he or she had no damage such

as a transfer of soil, irrigation that the other one adamantly opposed due to the fact that he or she could not change the ancestral land. At last, 17 people made the concession to the one person. In addition to replotting the land, the matter was proportional to the area of land owned by the original area of the declined by 0.8% compared to the land area of the farmland consolidation that had already been deducted. Thus, the Seongdong district was formed after farmland consolidation in the replotting of multiple ownership lands was completed.

Figure 3-1 | Pledge Form Letter for the Farmland Consolidation Project of Seongdong District, Sangju-eup, Sangju-gun, Gyeongsangbuk-do

Written Pledge

(1) Before Arrangement		(2) After Arrangement And Replotting		(3) Addition		(4) Substraction	
Lot Number	Record of Land Registration	Lot Number	Record of Land Registration	Pyeong	Price	Pyeong	Price
Total							

As a result of the farmland consolidation by the land amendment department of the Seodong district in 1964, the land (1) owned by me is agreed to be replotted to the land (2). I hereby understand that the land price of the added area (3) and subtracted area (4) are evaluated by the Land Evaluation Committee. I hereby shall pay the amount of money to your district or receive within one month of having received notification of the conclusion survey.

If violated above, I hereby shall acknowledge the separation of added areas from the irrigation canal entrance or any further legal actions.

1965

Owner address Gun Eup Dong

Name (Signature)

Farmer address Gun Eup Dong

Name (Signature)

To the section chief of Seongdong district land amendment

1.2. The Central Government's Adoption of the Farmland Consolidation Project

For the first time after the liberation Farmland Consolidation Project, the 'Advanced Gyeongsangbuk-do plan' in 1964 was adopted with the help of budget from the central government. There had never been demands from agriculture, rural communities, or farmers for the Farmland Consolidation Project. Even though there was not enough time to see the effects from the Farmland Consolidation Project initiated by Gyeongsangbuk-do, the adoption of the project as the central government's planned project resulted from President Park's strong commitment to agricultural modernization and the need for the Farmland Consolidation Project.

In the 1960's, financial resources for the project came from national funds (11%), the municipal government (21%), the relief grain by United States Public Law 480 (PL480-II) (33%), and the landowners (36%). Therefore, even though the project was adopted as a central government project, the local government led the project with the burden of the project on the municipal government and farmers. Among the nine provinces, Gyeongsangbuk-do and Gangwon-do conducted the Farmland Consolidation Project in 1964. At that time, the ratio of the farmer's efforts amounted to 74% of the total project cost. On the other hand, only 5% was supported by national funds. In 1965 when the project was adopted as the central government's project, the central government increased the ratio of the support by 10% of the total project cost and the ratio of the relief grain was also increased to 37%. In contrast, the ratio of the farmer's efforts decreased to 39%. Since 1968 the relief grain had increased the burden on the farmer's efforts and the ratio of the national fund increased up to a two-digit number ratio. However, the amount of funding from the central government was only 60% of the municipal government funding. The ratio of the central government from the total project cost was flexible. Moreover, the project cost continued to increase but the number of projects and the area of divisions continued to decrease after 1967. Even for 1969, the Farmland Consolidation Project was not significant.

Table 3-3 | The Project Cost of 1960's Farmland Consolidation Project (by financial resources) (1964-1969)

(Unit: ha, 1,000,000, %)

Year	Number of Divisions	Area	Financial Resources				
			Total	National Funds	Municipal Government	Landowner	Grain
Total	1,286	84,153	8,349(100.0)	887(10.6)	1,711(20.5)	3,008(36.0)	2,743(32.9)
1964	214	4,378	224(100.0)	11(4.9)	43(19.2)	165(73.7)	5(2.2)
1965	209	10,362	602(100.0)	58(9.6)	87(14.5)	232(38.5)	225(37.4)
1966	297	18,621	1,344(100.0)	127(9.4)	269(20.0)	557(41.4)	391(29.1)
1967	228	18,067	1,714(100.0)	150(8.8)	471(27.5)	640(37.3)	453(26.4)
1968	174	17,056	2,198(100.0)	251(11.4)	390(17.7)	691(31.4)	866(39.4)
1969	164	15,669	2,267(100.0)	290(12.3)	451(20.0)	723(31.9)	803(35.4)

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p.561

The Farmland Consolidation Project initiated by Gyeongsangbuk-do in 1964 was chosen to be a central government project in 1965. Since 1966, eight provinces except for Jeju-do implemented the project. With regard to the project area, Gyeongsangbuk-do had the largest scale. In 1964-1969, the area of farmland consolidation in Gyeongsangbuk-do was 48% (39,954ha) of the total (84,153ha), followed by Gyeongsangnam-do 14,840ha (18%), Chungcheongnam-do 7,889ha (9%), and Jeollabuk-do 7,036ha (8%). In 1964, Gyeongsangbuk-do and Gangwon-do, and in 1965 Gyeongsangnam-do and Chungcheongnam-do initiated the farmland consolidation, as well as Gyeongsangbuk-do and Gangwon-do. In 1966, eight provinces except for Jeju-do conducted farmland consolidations for 18,621ha. The area of the farmland consolidation kept decreasing to 18,607ha in 1967, 17,056ha in 1968, and 15,669ha in 1969. Even in Gyeongsangbuk-do, the area of farmland consolidation tended to decrease after 1967. This is because there was a limitation to expand the project only within the municipal government, not within the central government.

Table 3-4 | 1960's the Area of Farmland Consolidation by Provinces (1964-1969)

(Unit: ha, %)

Province	Total		Outcome by year					
	Area	Component ratio	1964	1965	1966	1967	1968	1969
Total	84,153	100.0	4,378	10,362	18,621	18,607	17,056	15,669
Gyeonggi-do	4,381	5.2	-	-	586	257	1,215	2,323
Gangwon-do	1,448	1.7	114	140	120	510	322	242
Chungcheongbuk-do	3,190	3.8	-	-	586	710	684	1,210
Chungcheongnam-do	7,889	9.4	-	957	3,022	1,899	823	1,188
Jeollabuk-do	7,036	8.4	-	-	959	1,735	2,542	1,800
Jeollanam-do	5,415	6.4	-	-	614	1,500	2,120	1,181
Gyeongsangbuk-do	39,954	47.5	4,264	9,126	9,994	8,601	4,024	3,945
Gyeongsangnam-do	14,840	17.6	-	139	2,740	2,855	5,326	3,780
Jeju-do	-	-	-	-	-	-	-	-

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p.562

2. Increased Demand of Farmland Consolidation and Improvements of the Legal Systems (1970's)

2.1. The Increasing Demand for Farmland Consolidation and its Goal

In the 1970's, and since 1964, regardless of the farmer's intention, the effects of local government-oriented farmland consolidation had been visualized. In rural areas, there had been, so called, modernization, so the farmer's perception of the Farmland Consolidation Project began to change. Moreover, after 1971 the establishment of the farmland consolidation project cost included 50% from the central government, 30% from the municipal government (province and village, 15% respectively), and 20% from the farmers. Therefore, they could establish a stable funding platform to support the project. Specifically, since 1972 the comprehensive development of large-scale agriculture in the districts such as Pyeongtaek, Geum, and Yeongsan, the farmland consolidation was implemented intensively. Hence, the local areas where the project had been sluggish in 1960's began to actively initiate the farmland consolidation.

In order to enhance land and labor productivity, the government planned to implement 40,000ha per year, and there were a total of 200,000ha of readjustment projects of arable land during the second five-year economic development plan period. However, due to insufficient financial resources, the project could not be accomplished as planned. In 1969, the government established a 10-year farmland consolidation plan. From the total paddy areas of 1,301,000ha, 588,000ha of the farmland consolidation subject area, which was equivalent to 50% of the target area of the well-irrigated paddy with 1,176,000ha, was set. This area was based on qualifications including more than 1/100 of the average degree of slope of consolidated divisions, a well-irrigated paddy, and divisions over 10ha.

Table 3-5 | 1970's Farmland Consolidation Subject Area

(Unit: ha, %)

	Total Area(A)	Subject Area(B)	Ratio (B/A)
1970s	1,301,273	588,000	45.2
1980s	1,315,933	706,000	53.7

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, pp.581-582

As there had been a drastic reduction of the rural labor forces in the 1980's, the introduction of farming machinery such as rice transplanters was very well received. This can be seen as the new phase of mechanized farming. As the construction of rural roads and irrigation and drainage canals was required for farm machinery to enter the farmland, the target area was expanded from 588,000ha to 706,000ha, which was 54% of the total paddy areas of 1,316,000ha. The criteria for selecting the subject division for farmland consolidation was the division size over 10ha, less than the 1/50 average degree of the slope, and a well-irrigated paddy with agricultural water resources.

2.2. Rearrangement of Farmland Consolidation Related Laws

2.2.1. Rearrangement of the Implementation System for Farmland Consolidation Project

In August, 1961, the「Special Act on Irrigation Association Merger」was enacted to merge 695 of the existing associations into 198 associations according to the principle of one Gun for one association. Then in December, 1961, the「Land Improvement Project Act」was enacted to unify the legal grounds for farmland measurements by abolishing the「Ordinance for Chosun Irrigation Association」the「Ordinance for Chosun Land Amendment」, and the「Act for Chosun Farmland Development」which was established during the Japanese

colonial period. In January, 1962, the 「Public Waters Reclamation Act」, the 「Cultivation Promotion Act」 in February, and the 「Regulations of Land Improvement Project Subsidies」 in August. In March, 1963 the 「Special Act on Land Improvement Projects Long-Term Bonds Management」, the 「Tide Embankment Management Act」 in December were enacted. The 「Groundwater Development Corporation Act」 was enacted in January, 1969. Therefore, the agricultural infrastructure management laws were established. Among those laws, the 「Land Improvement Project Act」 included the Farmland Consolidation Project so that it was the basic regulation for agricultural infrastructure management. Types of Land Improvement Projects were added with rearrangements of the district, and it also defined the project into a national project, a local government project, a land amendment association project, and a landowner project. The 「Regulations of Land Improvement Project Subsidies」 increased the previous rate of subsidies of 50% to 70%-80% with regard to Land Improvement Projects such as irrigation, drainage, reclamation, cultivation and farmland consolidation. Also it indicated the rate of subsidies for readjustment projects of arable land at 50%. However, since January, 1963, the rate of subsidies decreased, except for reclamation projects (rate of subsidies 80%). The rate of subsidies for readjustment projects of arable land decreased from 50% to 40%. As could be seen earlier, however, the central government covered only 10% of the project costs even if the Farmland Consolidation Project was adopted as the central government's budget projects, and even the rate plus relief gain increased to approximately 40%.

Agricultural infrastructure projects based on the "Land Improvement Project Act" enacted in 1961 lacked legal grounds and required a loan agreement to be signed in 1969 to propel large-scale agricultural comprehensive development projects or the farmers of improved housing and agricultural mechanization projects. There was also an overlapping area between the Union of Land Improvement Associations (ULIA) and the Groundwater Development Corporation. Specifically, for the procurement of the project costs of the all-weather agricultural water development plan, a loan agreement with IBRD was signed in May 1969 and was expected to be to effective as of December 31, 1969. However, there were no domestic related laws and regulations ("Land improvement project act") on the introduction of foreign capital so that it seemed that a loan agreement was not going to be effective. Thus the government included an agricultural mechanization business to upgrade the existing Farmland improvement project to improve and farm businesses. Also the government integrated the Union of Land Improvement Associations (ULIA) with the Groundwater Development Corporation, to make government-funded institutions for the introduction of foreign capital. They did this in January 1970 by paving the way for the agricultural Community by enacting the "Modernization Promotion Act" (Ministry for Agriculture, Forestry and Fisheries, Korea agricultural and Rural Infrastructure development "45 Year History", 1992, p.331)

The 「Agricultural Community Modernization Promotion Act」 consisted of 8 chapters and 189 articles and supplementary provisions. The contents of each chapter are as follows.

Chapter 1 General Provisions (Articles 1-Articles 8): Purpose, definitions, and project participation eligibility

Chapter 2 Farmland Improvement Association (Articles 9-Articles 64): Establishment, association member, legislative organ, employees/ officers, accounting, business, expenses imposition, disbanded, mergers, separation

Chapter 3 Agricultural Development Corporation (ADC) (Article 69, Article 90): Establishment, employees, officers, foreign capital, accounting, issuance of bonds, dissolution, etc.

Chapter 4 Project Implementation (Article 91-Article 151): The implementation of the farmland improvement project, the implementation of agricultural mechanization projects, the implementation of the farm house improvement projects, registration of farmland improved facilities, compensation management

Chapter 5 The Adjustment of the Rights (Article 159-Article 163): Furnishes, and easements, such as billing, effects, etc.

Chapter 6 Miscellaneous (Article 164-Article 176): The concession of state owned lands, subsidies, surveying design and supervision of construction of the consignment

Chapter 7 Supervision (Article 177-Article 183): Reporting and auditing, and delegation of authority, the association orders to disperse, etc.

Chapter 8 Penalties (Article 184-Article 189):

Addendum (Article 1-Article 12): Interim measures, etc.

As the 「Agricultural Community Modernization Promotion Act」 was enacted, the Agricultural Development Corporation (ADC) was established through merging Union of Land Improvement Associations (ULIA) and the Groundwater Development Corporation in February, 1970. At the time of its enactment, the major projects were mainly about technical agents working such as surveying design and supervision of construction on agricultural water development plans. The projects were guaranteed by the 「Agricultural Community Modernization Promotion Act」 and, as the main agent of projects such as farmland improvement project and farming house development project, a large scale project over 300ha was initiated and it took over the groundwater development project. Of these

projects, the agricultural water development plan and the Farmland Consolidation Project were able to promote the rationalization of management, so that the project's 200 bulldozers were used during construction. Thus, as a direct construction system, construction between 1970 and 1976 was implemented within one district of the agricultural water development plan with 76ha and 29 districts of the Farmland Consolidation Project with 5,350ha. However, the project was suspended due to many systematical problems in management.

If the government, local government, Farmland Improvement Association, and Agricultural Development Corporation (ADC) tried to implement the Farmland improvement project indicated in Article 2 in the 「Agricultural Community Modernization Promotion Act」, such as the agricultural water development, farmland consolidation, drainage system improvements, cultivation, reclamation, disaster restoration projects, and projects for the development or utilization of other farmlands, the agents should follow a series of legal steps such as the Venue Survey (Law Article 91), the Establishment of Fundamental Plan (Law Article 92), the Establishment of the Business Implementation Plan (Law Article 93), Notice (Law Article 94), Appeal (Law Article 95), and the authorization for project implementation. As indicated in <Table 3-6>, the process of the Farmland Consolidation Project begins with a Venue Survey, which followed the basic survey and in the initial period of November to March for the following year. In October of the current year the construction will be initiated and completed by May of the following year. In case of replotting and the disposal of registration, these tasks will be completed by the end of the next year after the completion of construction. The process is to take 4 years.

2.2.2. Expansion of Aid for the Farmland Consolidation Project

After 1971, the rate of subsidies for the project cost of the Farmland Consolidation Project was set by the central government at 50%, the municipal government at 30% (for provinces and villages, 15% respectively), and for farmers, 20%. Because almost all state grants in the United States stopped after 1970, rural modernization began and the need for the readjustment projects of arable land emerged from this.

The rate of subsidies in the 1980's, despite the increasing demand for the party Farmland Consolidation Project in 1983, increased the demand for the party Farmland Consolidation Project in 1983. It had not been able to meet the needs of the municipal government and its overloaded burden; the central government and the municipal government's burden ratio were adjusted in 1983. The farmer's burden remained at 20%, but the central government's burden increased from 50% to 60%. Instead, the municipal government's burden decreased from 30% to 20%.

Since the late 1980's, the relative decline of agricultural income intensified the burden for 20% for farmers and this became an obstacle to business expansion. As part of the measures

for farming and fishing villages, subsidies for the municipal governments remained at 20% but the farmers' burden decreased from 20% to 10%, and the central government's burden increased from 60% to 70%.

Even though the project cost for the Farmland Consolidation Project increased the burden on the central government and lowered the farmers' burden, business areas expanded from the plains to the mountains or poorly drained areas so that it was inevitable that the project cost per unit area would increase. Also, the factors that had increased the project cost had accumulated. Because of this, the project became burdensome in terms of the amount of money used, in spite of its small ratio.

The history of changes of the rate of subsidies in the 1970's and 1980's are as follows in <Table 3-7>.

Table 3-6 | The Implementation Procedure of the Farmland Consolidation Project Prescribed in the「Agricultural Community Modernization Promotion Act」

Division	Related Article	Content	Period
Venue Survey (Mayors and Governors)	Article 91	○ Venue survey by application from the authority or project operator	
The establishment of a basic plan (Minister, Mayors and Governors)	Article 92	○ The establishment of a basic plan if the business value is approved after the results of the venue survey	
The establishment of the project implementation plan (Minister, Mayors and Governors)	Article 93	○ If needed, the establishment of a project implementation plan ○ project operator designation, proposal submission	
Notice (Project operator)	Article 94	○ Project implementation plan notice, reviewed by person concerned	
Appeal (Person interested/concerned)	Article 95 Clause 1	○ If there is any objection to the content of the notice, the appeal is made to the project implementer	Within 30 days after receiving notice
The application for ruling whether or not the appeal is suitable (Applicant → Mayors and Governors)	Article 95 Clause 2	○ If appealed, the suitability opinion is attached to the application for ruling	Within 15 days after the appeal application
Suitability decision and notice (Mayors and Governors → Project operator)	Article 95 Clause 3	○ Notice of suitability decision on the application for ruling and reporting to the minister	Within 30 days after the application for ruling

Division	Related Article	Content	Period
The authorization for project implementation application (Project operator → Minister)	Article 96 Clause 1	○ Attachment (project implementation proposal, construction proposal, agreement letter, notice letter, copy, etc.)	
The authorization for project implementation (Minister → Project operator)	Article 96 Clause 2	○ Notice to project operator	
Approval notice (Project operator)	Article 96 Clause 3	○ Authorization notice	
The modification of the implementation plan (Minister → Mayors and Governors)	Article 97	○ Contents approved by Minister of Agriculture and Forestry - addition and reduction of the beneficial area - special engineering - changes of important constructs	
Designation of land for temporary use (Project operator → Beneficiary)	Article 123	○ Designation based on the natural condition, usability condition and notice of the initiation date for use	
Compensation for the loss by the designation of the land for temporary use	Article 125	○ The collection of money that is equivalent to the profit of the person making the profit	
Replotting plan (Project operator)	Article 126	○ The designation based on the natural condition, the usability condition, and made equivalent to the previous land ○ The designation of grouped replotting area for the efficiency of agricultural management	
Application for replotting plan approval (Project operator → Mayors and Governors)	Article 127 Clause 3	○ When applying for the replotting plan approval - notice of the brief summary of replotting plan - consent form: more than 2/3 of agricultural infrastructure development project participants	
Replotting plan approval (Mayors and Governors → Project operator)	Article 127 Clause 4	○ Replotting approval confirmation notice and notice to the head of a Gu, mayor, head of a Gun, and registry office	Announcement for more than 14 days

Division	Related Article	Content	Period
The effect of replotting disposal and the settlement of theliquidation amount	Law Article 129	○ Starting the day after the notice of the replotting plan; the previously owned land ○ Issuing the collection of the liquidation amount for the officially announced replotting plan	Within 90 days after approved date

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, pp. 565-566

Table 3-7 | The Ratio of the Project Cost Based on the Financial Resources for the Farmland Consolidation Project (1965-1992)

(Unit: ha, %)

Division	Implementation Area (ha)	The Ratio of the Project Cost by Financial Resources (%)			
		Central Government	Grain Aid	Municipal Government	Farmer
1965-1970	97,576	7	31	25	37
1971-1982	232,414	50	-	30	20
1983-1987	90,171	60	-	20	20
1988-1992	127,708	70	-	20	10

Sources: Rural Development Corporation (RDC), Comprehensive bibliography based on the agricultural infrastructure project, 1999, p. 564

2.2.3. Replotting System

In 1970, the 「Agricultural Community Modernization Promotion Act」 was newly enforced and enacted to complete the basic system and the propulsion system of the Farmland Consolidation Project. The Union of Land Improvement Associations (ULIA) were regarded as an agency for replotting works. But it was abolished after the establishment of the Agricultural Development Corporation (ADC). In 1971, the Agricultural Community Modernization Promotion Act was amended to newly include the 「Registration Replotting of Contractor Services」 which registered replotting disposal services companies so that 27 companies nationwide were enrolled. Due to the lack of professional human resources, the disposal of replotting areas was so negligible that there was pervasive distrust and discontent with the government. The governments recognized the seriousness of a situation and revised the laws in 1975 to make the registration policy for the replotting agency abolished. Instead,

the government made them a corporation to enable them to work quickly and accurately. In 1976, the Farmland Improvement Association was designated as a specialized agency for replotting work, so it was built with a solid foundation.

The early days of the assignment of replotting was mainly replotting in the original position. However, in the 1970's, project operators assisted the compromised replotting and the replotting of multiple ownership lands by creating events for farmers to attend and get professional advice. Moreover, through the government's plan to implement the preliminary replotting, two pilot districts in Gyeonggi-do were designated to conduct preliminary replotting. Starting in the fall of 1985, it was supposed to expand nationwide. However, there was a problem in the process of conducting the pre-replotting, so it became a public replotting method.

2.3. Development of the Technology for Farmland Consolidation

2.3.1. Evolution of the Planning and Design

Prior to the 1960's the size of farmland consolidation division was more than 10-15a. The width of the rural road based on carts or oxcarts was only 2.0-3.0m. In the mid-1960's, the industrialization at the beginning of the 30-40a cultivator had emerged. The direction of the farmland consolidation changed the size of division in a way that emphasized building mechanizations based on standard farming road widths, depending on farm machinery of 3.5m or more, the larger trunk farming road was increased to 6-7m.

Moreover, for the purpose of turning the farming road into a source of income, concrete and asphalt pavements were introduced. With regard to this, based on basic content enacted in 1979, it was aimed at the paddy. But the basic direction was newly established to enable the leverage of irrigation/drainage to be easier and to make the access of farming machinery even easier. Also it built the fundamental structure to make farms mechanized and farmland consolidated. The survey for farmland consolidation was divided into two phases: collecting data and the field study, and the main survey. The essential parts for farmland consolidation planning were surveys of soil quality, surveys of irrigational status, surveys of farming situations, creations of comprehensive plans of divisions, land registers, and directories of landowners.

Based on the revisions in 1983, field farmland consolidation was added and the basic direction was also revised. Also, land productivity and labor productivity, community development, and rural environment development projects were also added. Survey items for conducting the project were also added including subsurface geological characteristics, bearing powers of soil, groundwater level, clustering, socioeconomic conditions, and other related business.

2.3.2. Divisions

Based on the 1970's standards, ① the division is divided into an individual rice paddy, paddy divisions, and farming divisions. Paddy divisions and farming divisions are based on the consistency of irrigation and road conditions and its characteristics are given as the variable elements, ② field divisions (standard block) size is based on insecticide spraying in flatlander or mild slopes, the small scale of cultivation 30a with the emphasis on ease of replotting, ③ paddy division size was 3-9ha depending on drainage for ease of manipulation and the terrain conditions.

Based on the revised rearrangement plans in 1983, the planning was done by creating a flowchart to add a new agricultural plan, cropping plans, machinery and facilities planning, and the collective organization of production planning order to increase the level of planning.

With regard to the paddy, ① the division is divided into field division, paddy field land, and farming divisions, ② the division relies on the shape and placement of paddy field land in terms of the relationship between the irrigation/drainage canals and farming roads, and the re-zoning method needs to be presented in case of a paddy which needs to be rearranged.

When it comes to fields, ① the division is divided into possession division, field division, and paddy field land. The paddy field land is characterized as fixed factors surrounded by fixed facilities such as main and service roads, waterways, and wind prevention forests. The possession and field division are characterized as variable factors such as the scale of farmer possessions, crop rotation systems, and mechanizations, ② the basic shape of paddy field land is subdivided into 12 types differentiated by inclination, landform, soil, rainfall intensity, farm size, and farming conditions, ③ in contrast with the paddy, the size and shape of the field division is based on the efficiency of machine work, the irrigation method, and the cultivation management work, and the length of the longer side is designed at 20-25m, ④ the one side of the possession division must have access to the road, and the shorter side is designed to be at least 20m or 25m, ⑤ the slope area is required to be equipped with furrow or ditch type terraces in order to prevent the loss of soil, and the terrace is constructed at a regular distance in accordance with the degree of the slope.

2.3.3. Farming Roads

According to the established standards in the 1970's, the standards of farming roads are as follows: ① farming roads are distinguished by main roads and service roads, and at the same time, they are constructed next to waterways for the convenience of the operation and management of irrigation and drainage canals, ② farming roads are based on earthwork, but the width of farming road should be 5.0-6.0m (main road), 3.3-5.0m (service road), 1.5-3.3m (cultivation road), and the height should be 30-50cm (main road), 30cm (service road and cultivation road), and the pavement should be used with small pebbles at a thickness of 10-15cm, and the cross sectional grade is 3% and the longitudinal inclination is limited to 1/10, and the length of the ear notch is 1.5m at the intersection at a width of less than 4m.

Moreover, according to the established standards created in 1983, the standards of the farming roads are as follows:

With regard to the paddy, ① the width of the farming road should be 7.0m (main road), 5.0-6.0m (service road), 3.5-4.0m (cultivation road), and the height should be 50cm (main road), 40cm (service road and cultivation road), ② the cross sectional grade is the earth road (farming road), 3-6% (unpaved road), 1.5-2.0% (concrete or asphalt pavement road), and the maximum longitudinal inclination is usually 8% and 12% in special cases, ③ each field division needs a one entrance road of a width of about 4m and a slope of less than 18 degrees.

When it comes to fields, ① the farming road is divided into a main road, a service road, a cultivation road, and the cultivation road of fields is different from that of paddy, in that the road is characterized to be private roads constructed in the border area of field division or in the field division; ② the farming road is intersected at right angles on the flatland or slight slope area, and is arranged in a linear way in the areas where the land slope is over 14% (8 degrees) for the safety of driving and the conservation of roads and farmland; ③ the width of the farming road should be 6-7m (main road), 4-5m (service road), and 3m (cultivation road), and the cross sectional grade and longitudinal inclination is based on those of the paddy, but if it is not possible, the longitudinal inclination is allowed up to 20%. The diameter of the flexure portion should be at least 15m. The ear notch is based on that of the paddy; ④ the height of the service road is the same as that of the field surface, and the side division is installed with a grassed waterway in the slightly sloped areas and is installed strongly in main road and end-farming roads; ⑤ the surface structures of the main roads and the service roads at a longitudinal inclination of more than 15%(8.5 degrees) are designed for unpaved roads, macadam roads, and asphalt pavement roads.

2.3.4. Irrigation/Drainage Systems

According to established standards in the 1970's, the organization of irrigation and drainage canals is as follows: ① irrigation and drainage canals are distinguished from the main lines, branch lines, and offsets, and for the convenience of the management and operation of irrigation and drainage canals, waterways and farming roads should be constructed to be connected; ② irrigation and drainage canals should be separated; ③ the type of irrigation canals is based on open channels or pipe waterways, and the open channel type of irrigation branch lines should be based on linings or flumes, and irrigation offsets should be based on soil waterways, linings, and flumes; ④ the length of irrigation/drainage offsets is, like paddy division, 300-600m according to the convenience of irrigation/drainage management and terrain conditions, and the arrangement of irrigation/drainage branch lines depends on the length of irrigation and drainage offsets; ⑤ the height of the bottom of the irrigation offset should be, as a structure, 0-10m above the bottom of the paddy surface, and for the pipe waterways it should be a valve-based type.

According to the revised standards in 1983, when it comes to irrigation/drainage systems, ① the placement of the main line irrigation canal should be at an elevated position, and that of the main line drainage canal should be placed in a lower position separately in a slightly sloped area. With regards to flat land, both sides of the road should be placed separately; ② branch line irrigation and drainage canals should be distinguished by the type placed separately on both sides of the road and the type placed in turn between the branch line irrigation canal and the branch line drainage canal, depending on the regional circumstances; ③ when the irrigation canal is based on an open channel, it should be based on a concrete structure or pavement lining.

Next, the irrigation plan is as follows:

According to established standards in the 1970's ① proper water capacity for rice was 20-30mm/day; ② peak water capacity was based on the puddling water capacity but it was determined by the maximum evapotranspiration time, the size of the division, the initial watering of direct seedlings on the dry paddy, the time of the mid-dripping water, and the time of the fertilization operations, and the standard of the puddling water capacity was 120-180mm for the developed dry paddy; ③ the cross-section of the irrigation canal in the field division was based on the estimated quantities to be completed within one day of the irrigation time and irrigation of the paddy field land within 5 days, and the irrigation of the inner division within 10 days.

The supplemented and amended parts in 1983's standards were that of the puddling water capacity for the paddy, which was based on 140m and the capacity for the field was based on the standards for the Farmland improvement project planning design (irrigation part). For improving the labor productivity, the plan was to reduce the labor in the irrigation.

The drainage plan is as follows:

According to the established standards in the 1970s, the standards of the drainage plan were based on ① the estimated quantity of the surface drainage according to the rational method; ② the drainage of the paddy area in each field division was developed to be able to be completed within one day; ③ the height of the lower sluice gate out of the paddy should be less than 50cm from the paddy surface, and the width of the sluice gate was designed less than 50cm; ④ the depth of the drainage offset is 50-60cm below the rice paddy surface only for the surface drainage, and if the subsurface drainage is needed, the length should be 1m below the bottom of the paddy. Additionally, for the adjustment of the water level of the drainage offset, the water level management beams should be constructed in every 0.5-1.0m head of water at the end or in the middle of the paddy division; ⑤ the structure of the drainage canal was based on an open channel in general, but on an revetment in a deep drainage canal; ⑥ the minimum width of the irrigation/drainage offset was more than 0.3m; ⑦ the size of the block and unit irrigation depended on the terrain conditions and the capacity of the pump management but its standards in general were based on 30-50ha.

They supplemented and amended parts in 1983's standards were that, in terms of the paddy, ① the estimation of the planning capacity of drainage was based on the one day exclusion of daily rainfall in waterway unit pavements, and four hours exclusions of four hour amounts of rainfall in cropping after the rice harvest or paddy-upland rotation, and the drainage canal where the mountainous areas were out of divisions and the main line drainage canal covering the whole division was based on a rational method. ② With regard to rice farming, the permitted flooding depth was 30cm in general, but in special cases the flooding should not exceed 24 hours and irrigation should not be allowed; ③ In terms of the machine drainage plan, the proposed inner water level should be the lowest paddy surface plus the permitted depth of flooding. ④ The proposed standard rainfall was based on the 10-year of probable rainfall, ⑤ the revetment was used in an easily collapsing slope area, an easily erosive flowing area, and the area with frequent water level changes. ⑥ To prevent the water from flowing all at once during a flooding, the water gate for the inhibited efflux should be installed. Also, the backdraft prevention water gate should be installed in order to prevent the reverse stream resulting from the increasing external water level in flooding. Finally, sustainable beams should be installed to switch drainage to the irrigation canal.

With regard to fields, ① the estimation of planning capacity of drainage was based on the standards for farmland improvement project planning design (drainage part), ② if the place was high at the groundwater level or low in its impermeability layer, the subsurface drainage was to be planned.

2.3.5. Construction Equipment

The movement of soil is the main process for the construction of farmland consolidation, such as the consolidation of irregular farmlands, irrigation/drainage systems, and farming road installation and earthworks. Until the 1950's, this leveling work was still done by human or animal resources moving limited amounts of soil by using shovels, A-frame carriers, or handcarts. In the late 1960's, the bulldozer was introduced to the Farmland Consolidation Project. After that, from the 1970's the leveling work fully depended on bulldozers.

Since then, however, the choice of the bulldozer model was standardized and the method for soil movement was also revised. In other words, according to the bearing power of the soil, the models ranged from lightweight to heavyweight, and to swamp types to dozershovels.

Since the selection of construction equipment model was very dependent on construction costs, the construction period, and the maintenance of construction after the completion of construction, it was essential to consider a drop in the groundwater level through temporary drainage plans, the processing of rainfall, the movement of soil, distance, and the quality of the soil.

Therefore, the construction equipment for farmland consolidation has evolved from human and animal powered resources to machine resources. As the equipment selection techniques were developed, the driving techniques for such equipment were also specialized.

3. The Modernization of Readjustment Projects for Arable Land for the Improvements of Agricultural Structures (Since 1990)

3.1. Transition of the Project Support System

The eighth round of multilateral trade negotiations was conducted within the framework of 'the General Agreement on Tariffs and Trade (GATT)' in Punta del Este, Uruguay in September, 1986. Starting with the ministerial meeting declaration, the Uruguay Round finally made an agreement in 1993 after seven years of negotiations. Henceforth in 1995, the World Trade Organization (WTO) was established. The WTO was a stronger organization in comparison to the GATT because the WTO included produce, textiles, trade-related investment measures, and trade in services, which had not been included in the GATT. It also enforced legal binding which could resolve disputes related to trade. As the Uruguay

Round negotiations reached an agreement, tariffs were lowered significantly in the field of tariffs (6.3% → 3.8% for developed countries, 15.3% → 12.3% for developing countries) and in certain fields, there were customs free or tariff harmonization. In the field of produce, previously there were such exceptions for the GATT discipline as import restrictions were imposed due to food security and distinct characteristics of agriculture. However, instead of eliminating the non-tariff barrier, it reached an agreement on the unexceptional tariffs principle which switches domestic price differences to tariff equivalents, and the reduction of tariffs and tariff equivalents, and the reduction of domestic and export subsidies. With regards to rice, tariffication was delayed from 1995 to 2004, and it was opened step-by-step by up to 4% of the domestic consumption.

The initial interest during the Uruguay Round negotiations was in the improvement of international competiveness in the field of agriculture. In the meantime, the development of agricultural infrastructure was steadily promoted, but the international competiveness of agriculture was still very vulnerable. Agricultural mechanizations, consistent realization, the reduction of production costs, and the production of high quality produce were essential in agricultural management in order to increase the agricultural competiveness. For accomplishing these goals, modernized equipment was the first priority. The promotion plan for readjustment projects of arable land for strengthening the agricultural competitiveness was ① to implement the project by selecting target divisions according to the priority, taking into account the terms and conditions that can contribute to improved productivity, ② to increase the productivity by increasing the convenience of farm machinery and the efficiency of its operation, ③ to improve productivity through promoting cooperative farming and to increase the land use in rural areas, and ④ to improve the project effects by developing relevant businesses in fields around target areas and villages.

In 1992, there were groundbreaking measures to reduce the farmers' burden for the readjustment projects of arable land, and it was enacted in 1993. The project cost rates of subsidies for readjustment projects of arable land enacted since 1988 remained at 20% for municipal governments, but increased from 70% to 80% for central governments. Whereas there was only a 10% exemption from the beneficiary's burden to reduce their burden for the Farmland Consolidation Project.

3.2. The Adoption of the Large-Scale Farmland Consolidation Project

Until the mid-1970's, among the areas where the farmland consolidation has been conducted, there were many divisions where agricultural water development was completed and of which the slope was gentle and fertilized soil was suitable for rice farming. However,

these divisions were suitable for small farm machinery such as carts, handcarts, and cultivators, and they had no rural or narrow roads. The irrigation and drainage canals were used for both purposes and were constructed by earthwork. Also, it was difficult to manage water and large-scale farm machinery due to the small lot sizes.

In such target areas, the farming road was expanded and paved with concrete or asphalt for large farm machinery such as combines and tractors to pass through. All irrigation and drainage canals were installed separately according to the functions, but, if possible, it was recommended that the canals were to be structured out of concrete to promote the convenience of maintenance of hydraulic facilities and the management of agricultural water, but they should try to avoid the loss of agricultural water. The readjustment project of large arable land was supposed to be conducted for farming roads and for irrigation/drainage canals to be installed and to be accessible to all the lots. The demonstration project was initiated in 1991. Then, a nationwide survey of the subject area was carried out in 1992 and 1993, and was supposed to be expanded to 54,000ha by 1998. The criterion for the selection of the target areas for the large scale rearrangement of farmland was based on the fact that they were consolidated areas with a moderate degree of slope (less than 1/200), and with the residents' active participation they were included in the development of the farming areas and fishing villages in the city, as well as the control of gun-levels.

3.3. The Expansion of the Farmland Consolidation Project and the Modification of it Goals

As the Uruguay Round negotiations reached an agreement on December, 1993, the opening of the produce wholesale market evolved rapidly. With the launch of the WTO system in 1995, the agricultural subsidy policies for every country began to fall under international regulations. Under such circumstances, a drastic change in Korea's agriculture structures was foreseen. This was a result of the farmers' increasing concerns for the future. Therefore, as part of strengthening the international competiveness of agriculture, there was strong demand for the early implementation of agricultural infrastructure developments.

Since the early 1990's, the entire area of farmland was promoted to be used and preserved efficiently for the improvement of agricultural productivity. After that, agricultural development regions were divided into agricultural development regions and agricultural conservation regions. The Farmland Consolidation Project was adjusted to be conducted around the agricultural development regions. Moreover, the expenses for the Farmland Consolidation Project were from the central government (80%) and the municipal government (20%). Finally, the burden for farmers as beneficiaries came to be fully supported by national funding. In addition, the types of readjustment projects of arable land

were distinguished by general farmland consolidation and readjustment projects of large arable land, which were aimed at those regions with poorly consolidated farmlands among the readjustment projects of arable land that had already been conducted.

The priority criteria for selecting target areas of the general Farmland Consolidation Project were to be those paddies in the agricultural development region, to be secured with agricultural water, and there was an emphasis on having active participation in the area by community residents. Also, the consolidated size of the farmland was to be more than 10ha, and the average degree of the slope of the region was to be less than 1/50. Even the regions of which the consolidated size of farmland was more than 2ha, the degree of the slope was less than 1/15, and it was not an agricultural region, and those regions with relatively good conditions were also selected for the purpose of promoting the self-sufficient infrastructure in rice.

Among the areas where the farmland consolidation was conducted before 1976, the criteria for the selection of the readjustment project of large arable land included places where the area had no rural roads or only narrow roads. The irrigation and drainage canals were used for both purposes and were constructed by earthwork. Also, it was difficult to manage water and large-scale farm machinery due to the small lot sizes. The degree of the slope was to be less than 1/200. The regions were to have active resident participation and they should be included in the development of farming and fishing villages of the city, and gun-levels should also be a priority. Envisioning the possibility of fully mechanized farming, the government conducted the demonstration project since 1991. From 1992 to 1993 it carried out a nationwide survey of subject areas. The Farmland Consolidation Project aimed to enlarge the lot size to more than 1.0ha, and to install the structures of irrigation and drainage canals separately. Moreover, it also aimed to develop farming roads and to promote agricultural water development, drainage system improvements, stream irrigation, village maintenance, and road maintenance in a comprehensive way, rather than simply focusing on farmers. It also included land use of farming and fishing villages and the development of public facilities to promote cooperative farming for the purpose of the comprehensive development of rural areas.

The subject areas for general farmland consolidation were based on 78% (902,000ha) of the total paddy area (1,157,000ha) in 1998. Until 1998, 80% (723,000ha) of the total subject areas were completed and the rest of the areas (179,000ha) were planned for completion by 1999 to 2004.

As part of the readjustment project of large arable land, the Farmland Consolidation Project was supported with a large budget (4.3 trillion won), corresponding to 29% of the special tax for farming and fishing villages (15 trillion won). Among the areas where

farmland consolidation was conducted until the mid-1970's, 200,000ha of target areas in total were planned for completion (54,000ha until 1998, 146,000ha from 1999 to 2004).

Table 3-8 | 1990s' Goal for Readjustment Projects of Arable Land

(Unit: 1,000ha)

Division	Paddy Area	Subject Area	Before 1998	After 1999
Regular Division	1,157	902	823	179
Large Scale Division	-	200	54	146

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p.578

Among the major rural roads in farmlands where the farmland consolidation had been completed since 1995, the expansion and pavement project for the improvement of the mechanization farm road was paved with asphalt or concrete, especially on roads with a width of more than 4-5m at a one- lane size (3m). In addition to districts of the Farmland Consolidation Project, entry roads, which required the expansion and pavement with higher-level roads, were also included in the projects.

At this time, the development project for the roads in farming and fishing villages contributed to an increase in income and the improvement of living environment of rural areas. Also, there was an increasing demand for expansion and the pavement of rural roads due to the expansion and trend of large farm machinery. Specifically, rural roads were constructed as readjustment projects of arable land but the surface areas were not paved so it was difficult to manage the farm machinery. Also, produce was damaged during transportation and a reduction in labor productivity resulted from this. Because of these reasons, the need for developing rural roads emerged. Furthermore, paving rural roads was required for the improvement of agricultural productivity and the distribution system through the organic connections between facilities for production, process, and distribution in agricultural production complexes. Additionally, the pavement project could improve the living environment through the formation of a network of roads with higher-level roads including the roads in farming and fishing villages. Therefore, by 2004, the government planned to complete the expansion and pavement of major rural roads of 22,000km in the total areas (800,000ha) where farmland consolidation were completed.

The implementation system for farm road improvements involves ① budget support, confirmation of business districts, and provision of guidelines from the Ministry of Agriculture and Forestry, ② the mayor and governor's approval for project implementation and plan modification, ③ the selection of target areas for the project, detailed design, project

implementation, and supervision of construction by the mayor, the head of a Gun, as well as basic survey and technical support from the Agricultural Development Corporation (ADC). In terms of projects such as the field units of the plain area of large and middle scale districts (more than 500ha), most were centered on the agricultural development regions, the completion of the division of the large scale rearrangement of farmland, rice processing complexes, the development of rural homesteading, and hydraulic facility renovations, and expansion and pavement projects would also be implemented in advance. The expansion and pavement methods included ① expansion and pavement through installing open sewers in earth canals, ② the expansion and pavement of narrow rural roads through the changing of earth canals into piped waterways, and ③ farming roads without irrigation and drainage canals should be paved with concrete or asphalt in the first lane.

4. The Overall Transition of the Farmland Consolidation Project

Since 1964, there has been a significant change in the Farmland Consolidation Project regarding its system and contents.

Specifically, the rate of subsidies from the government increased. Since 1976, the replotting project agency incorporation has been used. The content of the project has been internally stable, as well as the institutional changes such as simple farmland consolidation systems (1987), large-scale farmland consolidation demonstration project (1991-1992), and the regular projects of large scale farmland consolidation (1995).

Table 3-9 | The Transition of Farmland Consolidation Project

Year	Content
1961	○ Establishment of the Land Improvement Project Act - Establishing farmland consolidation-related regulations.
1964	○ The adoption and implementation of readjustment projects of arable land as a part of local projects - Implementation of independent projects from Gyeongsangbuk-do, Gangwon-do, Chungcheongnam-do, and Gyeongsangnam-do
1965	○ The adoption and implementation of readjustment projects of arable land by government plans - The first farmland consolidation project conducted with government budget

Year	Content
1970	○ Enactment of the Agricultural Community Modernization Promotion Act → replacing the Land Improvement Project Act - The regulation of farmland consolidation, exchanging, divisions, junctionsprovement p b, s of agriculture, and replotting
1971	○ Selection of target subject areas for farmland consolidation - Target area: 588,000ha ○ Determination of the ratio of readjustment projects of arable land expenses - National budgets: 50%, municipal governments: 30%, beneficiary burdens: 20% ○ Enactment of the Agricultural Community Modernization Promotion Act - regulations for the registration of replotting operators
1975	○ The Farmland Improvement Association did business for the replotting works - Discontining registration for replotting operators
1977	○ The Farmland Improvement Association did business for the farmland consolidation survey design.
1978	○ Enactment of the Agricultural Planning Promotion Act
1980	○ Expansion of the readjustment project of the arable land subject area - 588,000ha → 706,000ha
1983	○ Modification of the burden rates of the readjustment projects of arable land - National funds: 50% to 60%, municipal governments: 20%, beneficiary burdens: 20% to 10%
1987	○ Adoption of the simple Farmland Consolidation Project - Targeted for small groups of farmland less than 10ha
1988	○ Modification of the burden rate of Farmland Consolidation Project - National funds: 60% to 70%, municipal governments: 20%, beneficiary burdens: 20% to 10%
1990	○ Enactment of Special Measures for Farming and Fishing Villages Development - The enhancement of business structures in agriculture, forestry and fisheries, and provisions for the enhancement of productivity and the living environment - For the operation of the agricultural development region
1991	○ the initiation of the demonstration project for the large scale farmland consolidation - field division size: 30-40ha → 50-200ha - the implementation of demonstration project in 8 districts (1992)

Year	Content
1992	○ Modification of the Farmland Consolidation Project's burden rate (implemented in 1993) - National funds: 70% to 80%, municipal government: 20%, beneficiary burden: 10% to 0% ○ Notice of the designation of the agricultural development region - Farmland area (1,034,000ha designated among 2,033,000ha) - Paddy: 735,000ha, fields: 139,000ha
1995	○ Establishment of the farming and fishing villages special tax law - Preparation for the financial resources of the Uruguay Round agricultural measures ○ Regular business of large-scale farmland consolidation - Implementation of large-scale Farmland Consolidation Project financially supported 100% by the central government (financial resources from Special Taxes for Rural and Fishing Villages)

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, pp. 579-580

2012 Modularization of Korea's Development Experience
Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

Chapter 4

The Implement System of the Farmland Consolidation Project

1. Legislation in Relation to the Farmland Consolidation Project
2. The Implement System and Procedure of Farmland Consolidation Project
3. Financing for Farmland Consolidation Project

The Implement System of the Farmland Consolidation Project

1. Legislation in Relation to the Farmland Consolidation Project

1.1. The Enactment and Amendments of Applicable Legislations

The first enacted act in relation to the modern readjustment projects of arable land in Korea was the「Ordinance for Irrigation Association」back in 1906, which mainly prescribed how to gather landowners who owned land within the project area and to obtain permits from the competent authorities in order to establish an association consisting of such owners as members, which was entitled to impose its members to pay membership fees and to perform forced labor. Afterwards, the「State-owned Uncultivated Land Utilization Act」was enacted in 1907 and specified regulations for the rental of state-owned uncultivated land that was not public-owned for no less than 10 years, including, but not limited to, wild plains, wastelands, sod plains, marshlands, and tidelands; and if the project succeeded on such rental lands, the appropriate lands could be transferred to relevant private ownership.

In 1910 when Korea was occupied by Japan, the Japanese Colonial Government promulgated the「Ordinance for the Joseon Irrigation Association」in 1917, which superseded the「Ordinance for Irrigation Association」; and promulgated the「Supplementary Rules for Irrigation Association」in 1919, prescribing the provisions to grant subsidies up to 15% of the construction cost to a project conducted by an irrigation association on the area of 200ha or larger. This was followed by the promulgation of the「Supplementary Rules for Land Improvement Projects」in 1920 which expanded the scope of application to be given subsidies from larger than a 200ha project area to no less than 30ha one, and the grant rate from the previous 15% segmented to 20% for irrigation, 25% for change of land category,

and 30% for cultivation and reclamation on an area of 30ha or larger, respectively. Three years later, the year of 1923 witnessed the promulgation of the 「Ordinance for *Joseon* Public Waters Reclamation」, by which a person could obtain a permit from a provincial governor for reclamation and acquire the appropriate ownership as of the date of authorization of completion. In 1927, the 「Ordinance for Joseon Land Improvement」 was promulgated, which applied to such projects as irrigation and drainage, land category changes, give-and-take and division-and junction of land, cultivation, and reclamation, by which an owner of land located within the area where any land improvement project was conducted shall not object the implementation of such project, as well as the project implementer including association members shall not apply for any damage caused by such project; and meanwhile, a single or multiple person(s) might conduct a land improvement project not through an appropriate irrigation association. Furthermore, in accordance with the 「Ordinance for *Joseon* Farmland Development Corporation」 enacted in December, 1942, the *Joseon* Farmland Development Corporation was established as a project agency to forcibly implement land improvement projects and authorized to compulsorily implement any land improvement projects whenever deemed necessary to construct on any land from a national perspective, regardless of the intent of such landowners.

The legislations mentioned above have survived the framework with partial amendments from time to time even until the 1950's after the restoration of Korean independence. Then, in 1961 when the military dictatorship came to power by staging a coup d'etat, and the legislation was entirely replaced by a newly enacted legislation in August of the same year. In August, 1961, the 「Special Measures for Consolidation of Irrigation Associations Act」 was enacted, which was followed by the 「Land Improvement Project Act」 in December of the same year; the 「Public Water Reclamation Act」 in January, 1962; the 「Cultivation Promotion Act」 in February of the same year; the 「Rules for Land Improvement Project Subsidies」 in August of the same year; the 「Special Measures for Settlement of Land Improvement Projects' Long-term Loans Act」 in March, 1963; and the 「Breakwater Management Act」 in December of the same year. Among these legislations, the 「Land Improvement Project Act」 applied to a whole range of land improvement projects including, but not limited to, readjustment of land, give-and-take and division-and junction of land, irrigation and drainage, construction of farm roads, conversion to rice paddy/upland, reclamation and cultivation, disaster restoration, and any other projects necessary to improve and preserve farmland, which revoked the existing legislations including the 「Ordinance for *Joseon* Land Improvement」, the 「Ordinance for *Joseon* Irrigation Associations」, the 「Ordinance for *Joseon* Farmland Development Corporations」, and the 「Special Measures for Consolidation of Irrigation Associations Act」, and renamed the irrigation association into the land improvement association. Additionally, the 「Rules for Land Improvement Project Subsidies」 defined the subsidy rate granted for the construction costs borne by each land improvement

project within 60% of such costs for irrigation and drainage projects (within 70% on the project area with 50ha or smaller), within 80% of the costs for reclamation and conversion to paddy fields, and within 40% of the cost for land readjustment, under-drainage, and changes in form and quality.

The 「Agricultural Community Modernization Promotion Act」 enacted in 1970 replaced the name of the land improvement project to the farmland improvement project and added the farm mechanization project and rural farmhouse improvement project, renamed the land improvement association to the farmland improvement association, and merged the Federation of Land Improvement Associations with the Groundwater Development Corporation to establish the Agricultural Development Corporation. The newly formed Agricultural Development Corporation was a government-invested institution with its officers appointed by the government and was entitled to induce foreign loans so that the 'Large-scale Comprehensive Agricultural Development Project' could be implemented in virtue of such loan arrangements entered as of May, 1969; whose enactment revoked the 「Land Improvement Project Act」 and the 「Groundwater Development Corporation Act」 and defined the land improvement association and the Agricultural Development Corporation as a separate organization. As a result, the federation, which was a governing organization for the nationwide 266 land improvement associations, was dissolved. The federation of land improvement associations was, however, reestablished as a public corporation under the amendment of the 「Agricultural Community Modernization Promotion Act」 in 1978.

In 1990, the 「Act on the Special Measures for Development of Agricultural and Fishing Villages」 and the 「Act on the Agricultural Development Corporation and the Farmland Fund Management」 were enacted. The former introduced the agricultural promotion region system to convert the system of farmland preservation by lot of land into the system of farmland preservation by district and the latter contributed to enacting the 「Agricultural Community Modernization Promotion Act」, under which the Agricultural Promotion Corporation was established to take responsibility to support the expansion of management scale of full-time farmers through the sales and rental of farmlands, in addition to the existing farmland improvement projects, farm mechanization projects, and rural farmhouse improvement projects, as well as to manage and execute the farmland management fund.

December of the year of 1994 saw the enactment of the 「Rearrangement of Agricultural and Fishing Villages Act」 which superseded the 「Agricultural Community Modernization Promotion Act」. The reason for such an enactment was to expand and reform the farmland improvement project into the agricultural production infrastructures improvement project "in order to promote the agricultural and fishing villages' development and improvement project on a systematic and comprehensive basis". This resulted in promoting the projects to create major agricultural promotion complexes and enlarge agricultural facilities besides

the projects that had been biased to rice paddies including irrigation and drainage and in improving the agricultural and fishing villages' living environment, including houses and roads ultimately for the purpose of promoting income enhancing projects in such communities. Shortly after, the 「Farmland Improvement Associations Act」 was enacted in December, 1995, because the regulations for the farmland improvement projects prescribed in the 「Agricultural Community Modernization promotion Act」 were incorporated into the 「Rearrangement of Agricultural and Fishing Villages Act」. Due to this reason, there was a need to arrange the remaining provisions from such incorporation as well as to gain the association's financial independence, autonomous development and efficiently maintain and manage the agricultural promotion infrastructures for the purpose of improving and supplementing the system related to the farmland improvement associations including the establishment of the 'finance firm for the autonomous farmland improvement associations.'

In February, 1999, the 「Act on the Agricultural and Rural Infrastructure Corporation and the Farmland Management Fund」 was enacted, under which the three institutions including the Rural Community Corporation, the Farmland Improvement Associations, and the Federation of Farmland Improvement Associations were consolidated to the establish the Agricultural and Rural Infrastructure Corporation; and accordingly the 「Act on the Agricultural Development Corporation and the Farmland Management Fund」 and the 「Farmland Improvement Associations Act」 were revoked. Such legislation was enacted to consolidate those three institutions that had conducted similar or overlapping functions in terms of the agricultural infrastructure rearrangement project and the management of agricultural infrastructure for the purpose of more efficient organization and enhancement of services for farmers. In December, 2008 when the Korea Agricultural and Rural Infrastructure Corporation changed its name to the Korea Rural Community Corporation, this act was renamed the 「Act on the Korea Rural Community Corporation and the Farmland Management Fund」.

1.2. Contents of Major Legislations

As described above, only two legislations prescribing the agricultural production infrastructure rearrangement including readjustment of arable land are currently in effect such as the 「Rearrangement of Agricultural and Fishing Villages Act」 and the 「Act on the Korea Rural community Corporation and the Farmland Management Fund」. Among those two, the key provisions in relation to the agricultural production infrastructure rearrangement projects as set forth in the 「Rearrangement of Agricultural and Fishing Villages Act」 are as follows:

The 「Rearrangement of Agricultural and Fishing Villages Act」 currently in effect is a framework act for the rearrangement of agricultural production infrastructures and

agricultural and fishing villages' living environment, which consisted of 107 articles under eight chapters as of its enactment in December, 1994. The areas of projects specified in this act included: the rearrangement of agricultural production infrastructure and the agricultural and fishing villages' living environment, cultivation of agricultural and fishing villages' industries, development of agricultural and fishing villages' tourism/recreation resources, and rearrangement of marginal farmlands. In accordance with this act, the rearrangement projects of agricultural production infrastructure meant the following: the development of water for agricultural and fishing use; the rearrangement projects of agricultural production infrastructure including rearrangement of farmland, drainage improvement and irrigation facilities improvement; farmland expansion/development projects including reclamation and cultivation; the creation projects of major agricultural production complexes and the expansion projects of agricultural facilities; and the water pollution prevention projects and water quality improvement projects for reservoirs and freshwater lakes; the farmland soil improvement projects; and any other necessary projects for the development and/or use of farmlands. The rearrangement of agricultural production infrastructure first requires the investigation of resources necessary to use and develop the land, village and coastal areas and then the establishment of a comprehensive plan for rearrangement of agricultural and fishing villages by the Ministry of Food, Agriculture, Forestry and Fisheries to set up and promote the regional/segmental rearrangement plan for agricultural production infrastructure, including rice paddy farming, filed farming and controlled agriculture, while conducting an investigation on the candidate areas in the region which have applied for such projects or are deemed necessary to conduct such projects. As a result, the feasibility project would lead to a basic examination and then the establishment of a basic plan for the rearrangement of agricultural infrastructure. In addition, when desiring to implement any project under such basic plan, the implementer will be appointed as the entity to conduct such rearrangement projects, allowing the implementer to set up, and make public, its own implementation plan, for which the implementer shall obtain more than 2/3 of the rights holders for the appropriate land and obtain approvals from the Ministry of Food, Agriculture, Forestry and Fisheries (as for the readjustment of arable land and the improvement of agricultural production infrastructure, obtain approvals from the appropriate municipal/provincial governor). The implementer entitled to be designated to conduct such rearrangement projects of agricultural production infrastructure is limited to the nation, local governments, the Korea Rural Community Corporation, and landowners. The project implementer would arrange the land after conducting its project and set up a replotting plan to settle any imbalance of interests monetarily and then would announce these plans for more than 14 days, while obtaining consent from more than 2/3 of landowners and then obtain the necessary permits from the appropriate municipal/provincial governor. The replotting plan shall be conducted corresponding to the land plotting before conducting

such project, but designate a collective replotting area for the purpose of the rationalization of agricultural management.

2. The Implement System and Procedure of Farmland Consolidation Project

2.1. The Implementation System and Procedure of Farmland Consolidation Project as Prescribed in the「Land Improvement Project Act」

In accordance with the「Farmland Improvement Projects Act」which was enacted in 1961 and had been effective until the year of 1969, the entity allowed to participate in such projects was defined to the owners of land situated within the area where such projects were implemented. Additionally, the act only permitted the nation, local governments, land improvement associations, or landowners to implement such rearrangement projects, applying different implementation procedures to each implementer, where the basic procedures consisted of: ① the application for project implementation or license for such a project implementation, ② consideration, notification and disclosure to the public, ③ formal objection, and ④ license and notification.

2.1.1. The Land Improvement Projects Implemented by the Central Government

The land improvement projects implemented by the central government are divided into two categories: the projects based on the application process and other projects that may be conducted without any application. The projects that are entitled to apply for the national land improvement projects include the projects in relation to new construction, management, revocation, and modification of irrigation and drainage facilities, of which the implementer should secure the area with 500ha of land or larger. The projects that can be implemented by the nation include: the conversion to paddy rice/field from, the reclamation and cultivation of state-owned lands.

The land improvement projects implemented by the central government based on an application shall be subject to the following implementation procedures:

① Application for project implementation: The party entitled to participate in land improvement projects, including landowners, shall obtain consent from more than 2/3 of those who are entitled for such participation to apply for the national implementation of land improvement project to the Minister of Agriculture and Forestry for approval.

② Consideration, notification, and disclosure to the public,: Where the minister considers the applied project and deems appropriate, he/she shall select the applied project as to-be-implemented and notify such matters, and make the copies of the land improvement project plan available to the persons concerned for more than 20 years.

③ Formal objection: Where any person concerned does not agree with the notified project plan, he/she may object to the Minister of Agriculture and Forestry; if there are any objections, the minister shall determine whether the objection is or is not appropriate within 60 days after the notification.

④ The central government shall commence such project only when there are no objections raised or if any there are any objections, only after is it deemed to be appropriate is determined as prescribed in Paragraph ③ above.

When the central government implements any land improvement project without an application, the Minister of Agriculture and Forestry may set up a project plan and notify the overview of the plan and any other necessary matters, then obtain consent from more than 2/3 of the persons entitled to participate into any land improvement project within the project implementation area. This is followed by the same procedure as for the projects which require an application, such as notification of the project, disclosure of the plan for more than 20 days, receipts of objections within 20 days after the notification, and determination of appropriateness within 60 days after the notification.

In the meantime, the central government may delegate part or all of the state-implemented construction to the Seoul Metropolitan Government or any appropriate province which has its partial or whole jurisdiction on such project areas. This is provided that the projects that can be delegated are limited to the conversion to rice paddy/field from the state-owned land with 200ha or smaller and the reclamation/cultivation project on the land with 50ha or smaller, and the disaster restoration projects for irritation/drainage/farm road facilities which have been installed as part of those two conversion and/or reclamation projects; and may make part of the project cost borne by such delegated entity. The contribution amounts to less than 50/100 of the net construction cost on the appropriate land, which shall be fully amortized of its principal and interest at an annual interest rate of 3% for the 30-year redemption period on a yearly installation basis.

2.1.2. The Land Improvement Projects Implemented by Local Governments

The land improvement projects implemented by local governments shall be subject to the same procedure as for the land improvement projects implemented by a single/multiple person(s) ranging from the application for a permit of project implementation to the

following process; the notification of the overview of plan and any necessary matters requires a resolution by the municipal/provincial councils prior to the application for permit, and to obtain the consent of more than 2/3 of the parties entitled to participate in such projects within the implementation area and if there exists, any land improvement association whose district falls, partially or wholly, under the appropriate project implementation area, obtained consent from such associations. After undergoing the process prior to the application for a permit, if the appropriate local government comes up with its desired land improvement project and prescribes the relevant rules to the Minister of Agriculture and Forestry, the ministry shall consider the application to determine whether to be appropriate or not, and notify the result to the applicant and make the permit public and allow the copies of such project plans and rules to be made available to the persons concerned for more than 20 days. The concerned parties may object to the project within 30 days after the notification and upon their objection, the ministry shall determine its appropriateness within 60 days from the notification. If there are no objections filed or objections are not accepted, the ministry shall permit and announce the implementation of the project.

2.1.3. Land Improvement Projects Implemented by Land Improvement Associations

Land improvement projects implemented by any land improvement association first requires establishing the association with more than 15 initiators who are entitled to participate in the project, obtain consent from more than 2/3 of those initiators, develop a project plan and prescribing the articles for the association and any other necessary matters to apply for approval for the land improvement association from the Minister of Agriculture and Forestry. The minister shall consider the plan and articles of association and determine whether it is appropriate or not to notify the applicant while announcing its approval and making the copies of the plan and articles of association available to the public for more than 20 days. In the meantime, if there are any parties concerned who do not intend to follow the ministry's decision, he/she may object against the project plan within 30 days after the notification; in response to such objection, the minister shall determine whether to accept the objection or not within 60 days after the notification. Where there are no objections against the approval of the establishment of an association or he/she rejects the objection, the minister shall approve and notify the establishment of the association. The expenses arising from the association establishment shall be borne by the appropriate association, but if the association is not approved, the applicant who applied for the establishment shall be borne the expenses.

Before starting the land improvement project, the appropriate land improvement association shall report to the following information to the tax office and registry: the date

of establishment of the land improvement association or the approval of land improvement project, the scheduled start/completion date of construction, the address/lot number/area of each land, the lot number after the completion of construction, and the estimate of total areas by land purpose. When the association starts or completes construction of the project, it must promptly report it to the relevant municipal/provincial governor, the tax office and registry. Furthermore, where it desires to modify or cancel an existing land improvement project, or newly implement any land improvement projects, the land improvement association must obtain approval from the Minister of Agriculture and Forestry after undergoing a resolution in the appropriate council, where the minister approves the revocation of the project, he/she shall promptly make public the matter.

If construction is completed, the association must set up a replotting plan which obtains consent from more than 2/3 of the landowners and the house/facility owners on the land without delay and submit the plan to the Minister of Agriculture and Forestry for approval. Where he/she approves such replotting plan, the minister must promptly announce the matter and notify the tax office and registry.

2.1.4. The Land Improvement Project Implemented by a Single or Multiple Person(s)

When a single person or multiple persons jointly desire(s) to implement a land improvement project, they must undergo the same procedures as mentioned above, consisting of an application for approval, consideration, notification and disclosure to the public, objection, approval for implementation, and announcement, whose contents are the same as in the implementation approval procedure where the local government must comply when it applies for an implementation of land improvement project.

2.2. The Implementation System and Procedure of Farmland Consolidation Project as Prescribed in the 「Agricultural Community Modernization Promotion Act」

The 「Agricultural Community Modernization Promotion Act」 was enacted in 1970 and revoked in 1996, under which the term, land improvement was revised to farmland improvement and accordingly, land improvement associations became farmland improvement associations. This act divided the parties who were entitled to participate in land improvement projects into the landowners under the 「Land Improvement Project Act」 consisting of: the landowners who used, and benefited from, their land for agriculture; and the other landowners who used, and benefited from, their land for a purpose other

than agricultural purpose.[1] As an implementer, in addition to the nation, local government, farmland improvement association, and landowners, the newly established Agricultural Development Corporation under this act was added and accordingly, the basic procedures of the implementation of farmland improvement projects was the same as specified under the 「Land Improvement Project Act」, involving the following: ① application for project implementation or application for approval of project implementation, ② consideration, notification, and disclosure to the public, ③ formal objection, and ④ approval and announcement. However its detailed provisions were prescribed a little differently according to who was the implementer in the same way as specified in the Land Improvement Projects Act.

2.2.1. Farmland Improvement Projects Implemented by the Central Government

As specified in the 「Land Improvement Project Act」, the 「Agricultural Community Modernization Promotion Act」 prescribed the division of land improvement projects into two: a project with application and a project without application; provided that, the project that was entitled to apply for a land improvement project implemented by the nation limited its scope to the project involving new construction/modification of irritation/drainage facilities on an area with 50ha or larger situated within the land improvement project implementation district,. This was a greatly narrowed its scope from the previous 500ha or larger area and to which the land readjustment projects and the disaster restoration projects for facilities were added. Besides, as a land improvement project which would not need an application and be implemented by the nation, the land readjustment projects were added and the existing ones including the conversion to rice paddy/field, reclamation, and cultivation.

The following paragraph describes the difference between the implementation procedure of land improvement projects implemented by the nation via an application and the provisions as specified in the 「Land Improvement Projects Act」:

① Application for project implementation: Any local government and a land improvement association and more than 20 landowners shall obtain consent from more than 2/3 of the parties entitled to participate in the project and apply for land improvement project implementation to the Minister of Agriculture and Forestry for national approval. Under the 「Land Improvement Projects Act」, landowners and the parties entitled to participate in a land improvement project are granted the right to apply for such project implementations. However, the provision prescribing the consent from more than 2/3 of parties entitled for the project is intact, the same in either of the acts.

1. This reflects the situation where there existed a landowner who used, and benefited from, their land for a purpose other than agricultural purpose, within the land improvement project implementation area.

② Consideration, notification, and disclosure to the public: Where he/she considers the project application and deems it appropriate, the Minister of Agriculture and Forestry must establish the land improvement project plan and notify its intent and make its details available to the people concerned for 10 to 20 days. Under the Land Improvement Projects Act, such disclosure was defined to the period of 20 days.

③ Formal objection: Where any person concerned does not agree with the notified project plan, he/she may object to the Minister of Agriculture and Forestry within 40 days after the notification; if any objections exist, the minister must determine whether the objection is appropriate or not within 90 days after notification. The objection period increased from 20 days to 40 days from the notification date; and the determination of whether the objection is appropriate or not increased from 60 days to 90 days from the notification date.

④ The Minister of Agriculture and Forestry must implement the project under the farmland improvement project plan when there are no objections filed within the prescribed period, or if there are any objections, after the objection is not accepted, the same in either of the acts.

The farmland improvement project implemented by the nation without any application does not undergo the procedure to apply for the implementation of a farmland improvement project. However, the Minister of Agriculture and Forestry must set up a farmland improvement project plan and notify its overview and any other necessary matters, and then obtain consent from more than 2/3 of parties entitled to participate in this kind of project within the project implementation district. The subsequent procedures involved in the notification of the project plan and disclosure to the public for 10 to 20 days, a formal objection to be filed within 40 days from notification, and the determination of its appropriateness within 90 days after notification, the same as prescribed for the farmland improvement project's implementation procedure that requires an application for implementation.

In the meantime, the Minister of Agriculture and Forestry may implement a land readjustment project jointly with the local government, but only when it is deemed necessary to promote, in particular the readjustment project. When it is necessary to implement the project, the minister must notify the overview of the project plan and any other necessary matters and make the detailed content available to the concerned parties for more than 10 days. Also, where the Minister deems it enhancing more the effectiveness of the farmland improvement project and contributing to the rationalization of agricultural management, to implement the projects for installation of farmland improvement facilities, and cultivation and reclamation combined with a land readjustment project, the minister shall make such land readjustment project jointly implemented. Besides, the nation may make any municipal/provincial governor who has a jurisdiction on the appropriate farmland

improvement project district borne, partial or wholly, the project costs (within 50/100 of the net construction cost); and the municipal/provincial governor may collect some of the contributions from the revenues earned from the beneficiaries who benefit from the project. If this beneficiary is a member of an association, the governor may collect a portion of the prescribed contributions from the beneficiary.

2.2.2. Farmland Improvement Projects Implemented by Local Governments

Compared to the procedure of the farmland improvement project implemented by the nation, those implemented by local governments differ only in the application for implementation approval after undergoing the resolution in the appropriate municipal/provincial council, the rest of which is intact and the same as in either of the two acts. The procedure of the farmland improvement project implemented by local governments is as follows:

① Application for project implementation: When a local government wishes to implement a farmland improvement project, it must establish a land improvement project plan after undergoing a resolution in the council and notify the overview of the project plan and any other necessary matters, and obtain consent from more than 2/3 parties entitled to participate in the project and submit the project plan accompanying any supporting documents to the Minister of Agriculture and Forestry for approval of implementation.

② Consideration, notification, and disclosure to the public: The Minister of Agriculture and Forestry shall consider the project plan and determine whether it is appropriate or not, and then notify the results to the applicant. If the application is deemed appropriate, he/she shall make public the intent and disclose the details to the people concerned for 10 to 20 days.

③ Formal objection: Where any person concerned desires to file an objection against the minister's decision, he/she may object within 40 days from the notification; upon the objection, the minister shall determine whether it is accepted or not within 90 days from the notification and notify the results to the applicant.

④ The Minister of Agriculture and Forestry must approve the implementation of the applied farmland improvement project only when there are no objections filed or if any objections exist, after the objection is not accepted, and shall announce it without delay.

Where any entity desires to modify, suspend, or revoke the farmland improvement project plan which has been approved under the procedures above, he/she shall obtain approval from the Minister of Agriculture and Forestry.

The local government may make any beneficiary, who benefits from the farmland improvement project that it has implemented, take on some of the project costs as prescribed in the applicable ordinance and can also collect special contributions from the beneficiaries whose revenues reach a significant level compared to any other beneficiaries. When a beneficiary who benefits from the farmland improvement project is a member of the appropriate farmland improvement association, the local government may collect the amount equivalent to the contributions from this member. If a person disagrees with the collection of contributions by the local government, he/she may object within 20 days after the notification date and subsequently, the municipal/provincial governor must determine whether it is appropriate or not within 20 days from the objection. When he/she rejects to follow the decision, he/she may apply for a decision based on re-consideration within 14 days after the receipt of the decision. If there are any applications for the decision again, the minister shall decide the appropriateness within 20 days after the application and notify the result to the applicant.

2.2.3. Farmland Improvement Projects Implemented by Farmland Improvement Associations

When compared to the procedure of farmland improvement projects implemented by local governments, those implemented by farmland improvement associations differ in the following ways: the provisions for the application for implementation approval requires resolution from not a local council but from the general assembly of the association; and the rest of the procedures after the application for project implementation is intact, the same as in either of the two acts. The other differences come from the provisions under which if its farmland improvement project is completed, the appropriate farmland improvement association shall report it to the Minister of Agriculture and Forestry; and if it wants to modify the project plan, or suspend or revoke the project, it must obtain consent from the minister after resolution from its general assembly.

2.2.4. Farmland Improvement Projects Implemented by the Agricultural Development Corporation

The procedure to implement a farmland improvement project by the Agricultural Development Corporation is the same as the aforementioned basic procedure involving the establishment of a farmland improvement project plan, the notification of the overview of project plan and any other necessary matters, the application for project implementation to the Minister of Agriculture and Forestry with consent from more than 2/3 parties entitled to participate in the project, the following consideration/notification/disclosure and objection, and the approval for project implementation and the announcement. When completing

a farmland improvement project, the corporation must report it to the minister; and if it wants to modify the project plan, or suspend or revoke the project, the corporation must obtain approval from the minister. The Agricultural Development Corporation, as a project implementer, may collect some of the project costs from the beneficiaries who benefit from the project and may also charge special contributions on the beneficiaries whose revenues from the project reach a significant level. If the beneficiary required to pay the contributions is a member of any farmland improvement association, the corporation may collect the amount equivalent to the contributions which would be otherwise borne by the beneficiaries, from the appropriate farmland improvement association.

2.2.5. Farmland Improvement Projects Implemented by Landowners

When a single person or multiple persons wish to implement a farmland improvement project, they must establish a farmland improvement project plan and obtain consent from all of the participants of the appropriate project, and then submit the project plan and the prescribed rules accompanying the supporting documents to the Minister of Agriculture and Forestry for approval; and the rest of the procedure is the same as in the basic one described above involving in the consideration/notification/disclosure for the application for project implementation and the formal objection, and the approval for project implementation and the announcement. The procedure to report the completion of farmland improvement project to the minister is also the same as the above.

If the construction of farmland improvement project is completed in accordance with the procedures above, the implementer of the project must notify the overview of the replotting plan and any other necessary matter for more than 14 days; and obtain consent from more than 2/3 of the parties entitled to participate into the farmland improvement project implemented within the appropriate district, and then prepare for the replotting plan without delay and obtain approval from the Minister of Agriculture and Forestry. If he/she approves the replotting plan, the minister shall announce the matter without delay and notify it to the head of ward office, the mayor or governor, and the registry.

2.3. The Implementation System and Procedure of Farmland Consolidation Project as Prescribed in the「Rearrangement of Agricultural and Fishing Villages Act」

The「Rearrangement of Agricultural and Fishing Villages Act」was enacted in December, 1994 and has been in effect since 1995. The term of farmland improvement project was revised to agricultural production infrastructure project and the farmland improvement association would be subject to the「Farmland Improvement Association Act」enacted in

December, 1995, which defined the parties entitled to participate in the farmland improvement project as specified in the 「Agricultural Community Modernization Promotion Act」: the landowners, the real right holders and the owners who use, and benefit from, the land for the purpose of agriculture; and the landowners and the real right holders and owners who use, and benefit from, the land for a purpose other than agriculture. In addition, the provision prescribing the implementer of an agricultural production infrastructure project is intact, involving the nation, local governments, the Agricultural and Fishing Villages Promotion Corporation, farmland improvement associations, and landowners.

The procedure to implement an agricultural production infrastructure project significantly changed under the 「Rearrangement of Agricultural and Fishing Villages Act」 as follows: ① the use of land, villages and coastal areas and the investigation on resources required for development, ② the establishment of comprehensive agricultural and fishing villages' rearrangement project plans for the purpose of development and rearrangement of the infrastructures for agriculture production/fishery production, rural living environment, rural recreational resources, and marginal farmland, ③ the establishment and promotion of the regional/segmental agricultural production infrastructure rearrangement plan including rice paddy/field farming and facility farming, ④ the implementation of investigation on candidate areas with the designated district in accordance with the appropriate agricultural production infrastructure rearrangement plan if any application from an implementer conducting a project or if deemed necessary, ⑤ as a result, if a project is deemed feasible among the applied agricultural production infrastructure rearrangement projects, the primary investigation on the appropriate project district and the establishment of the basic plan for an agricultural production infrastructure project, ⑥ the detailed design for the designated district where an agricultural production infrastructure rearrangement project will be implemented and established, ⑦ the designation of an implementer who will conduct an agricultural production infrastructure rearrangement project and the deliver the implementation plan, ⑧ the notification and disclosure of project details made available to the parties entitled for participation by the designated implementer and the obtain consent from more than 2/3 of those parties, ⑨ any objection filed by any of those parties, and ⑩ the application for re-determination accompanying the statement indicating whether the designated implementer deems the objection appropriate or not, to the mayor/governor or the Minister of Agriculture and Forestry, the application for the project implementation approval by the implementer to the minister, and the approval of the project implementation and notification to the implementer of, and the announcement of, such implementation. When an implementer wants to modify or revoke the approved agricultural production infrastructure rearrangement project implementation plan, he/she must obtain consent from the minister.

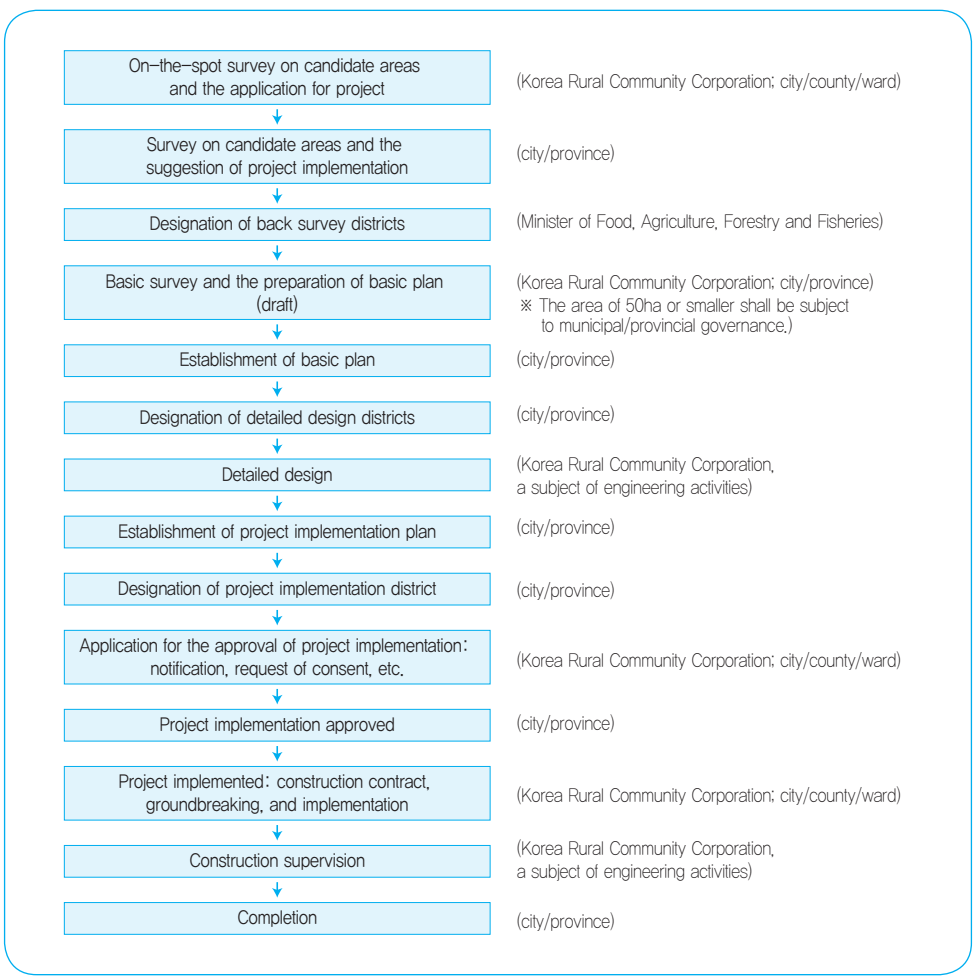
The implementer of an agricultural production infrastructure rearrangement project must develop a replotting plan in order to designate the land and settle any imbalance of interest in monetary means after the project is implemented, and then make public its overview and any other necessary matters for more than 14 days and apply for approval from the Minister of Agriculture and Forestry with consent from more than 2/3 of parties entitled for participation. Any person concerned may object against the notified replotting plan within 15 days from the date when the notification expires. The implementer of the appropriate project shall apply for determination based on re-consideration accompanying the opinion about the appropriateness to the mayor/governor or the Minister of Agriculture and Forestry within 15 days from the date when the objection period expires. If there are no objections or if there are any, when the objection is rejected, the implementer must apply for project approval to the minister; and if he/she approves the project implementation, the minister shall announce it without delay and notify it to the mayor/governor and the registry.

The 「Rearrangement of Agricultural and Fishing Villages Act」 was amended in June, 2009, under which the authority to establish the basic plan involved in the readjustment projects of arable land, and the improvement/maintenance/construction projects of agriculture production infrastructure was transferred to the mayor/governor from the Minister of Agriculture and Forestry. Also the promotion system of agricultural production infrastructure rearrangement project was modified from the previous provisions by which the minister or the mayor/governor must establish the project plan and has the authority to designate a project implementer to the new projects and if a project implementer is designated, this individual must develop his/her project implementation plan and then go through the procedures involving notification, disclosure, consent, and objection and shall obtain consent from the mayor/governor. Also, the amendment supplemented the provision prescribing the approval procedure of replotting plan: if a project implementer obtains approval, he/she must notify the overview of his/her replotting plan and any other necessary matters for more than 14 days and must separately notify the landowners.

As of February, 2013, the procedure as prescribed in the 「Rearrangement of Agricultural and Fishing Villages Act」 was revised to the following: the procedure to conduct a basic investigation and establish a basic plan among other processes set forth in Items through ⑤ not by the Minister of Agriculture and Fishery but by the mayor/governor; the procedure to designate an implementer among other processes set forth in Item ⑦ inserted to Item ⑥ where the detailed design and the establishment of the implementation plan shall be conducted by the designated implementer not by the minister. Objections set forth in Item ⑨ was altered to be filed not by the parties entitled for participation but by the person having the right to the land situated within the project district; and the procedure set forth in Item ⑩ was changed into the notification of consideration opinion by the implementer of the

project to the person who files an objection; accordingly, the implementer shall reflect such opinions to the implementation plan. The application for implementation approval for the Farmland Consolidation Project and the improvement/maintenance/construction projects of agricultural production infrastructure facilities was revised to be submitted to the mayor/governor, as were revisions the implementation plan. The implementation procedure of arable land readjustment projects, which remains in effect until late in 2012, is shown in [Figure 4-1] as prescribed in the Rearrangement of Agricultural and Fishing Villages Act.

Figure 4-1 | The Implementation System and Procedure of Arable Land Readjustment Projects pursuant to the 「Rearrangement of Agricultural and Fishing Villages Act」



3. Financing for Farmland Consolidation Project

The system to finance part of the construction costs from the rearrangement project of agricultural production infrastructure including a Farmland Consolidation Project from the government subsidies was modified four times under the applicable laws that prescribed provision from the Japanese colonial era until today, including: the「Supplementary Rules for Land Improvement Projects」enacted in 1920; and the rules enacted in 1958, which succeeded the same title as the above; the「Rules for Land Improvement Project Subsidies」enacted in 1962 and remained in effect until 1969; the「Regulations for Agricultural Community Modernization Promotion Subsidies」enacted in 1970 and in effect until 1985 but revoked in 1995; and the「Act on Budget and Management of Subsidies」enacted in 1986 and currently in effect.

In 1920, the Japanese colonial regime enacted the「Supplement Rules for Land Improvement Projects」to grant government subsidies at a certain rate of the construction cost of land improvement projects. The subsidies were granted to business operators who conducted land improvement projects; and if any province gave subsidies, the government subsidies were granted to those provincial governments, but, subsidies were not given to projects conducted on areas with 10ha of land or less. The expenditures for construction costs, which were the grounds to calculate such subsidies, included: measurement and design costs, construction supervision costs, land purchase and compensation costs, construction materials and installation costs, labor costs, and any other expenses necessary for construction. The rate to grant subsidies to construction costs varied: 20% for irrigation improvement projects, 25% for conversion of land category, and 30% for irrigation from 1920 through 1939; and 30% reclamation from 1920 through 1928, which increased to 50% from 1929; and then the rate of government subsidies increased to: 50% for irrigation and drainage improvement, and reclamation in 1940 and 30% for conversion to rice paddy, arable land readjustment, and under-drainage in 1940 while the construction costs for a small-scale land improvement project conducted on area with 10ha or smaller were funded by 25% from the government subsidies and 25% from provincial government subsidies. Since December, 1942, the irrigation/drainage improvement projects and the conversion of land categories and reclamation were subsidized by divisions of large districts and small districts, under which those large districts were subsidized up to by 55% from the government.

The Supplement Rules for Land Improvement Projects enacted during the Japanese colonial regime was in effect until 1957; under which, the rate of government subsidies was adjusted to 50% for all kinds of projects from 1946 through 1949 and then decreased to 30% in 1950 but subsequently increased to 80% in 1951; and then finally adjusted to 50% from 1952 through 1957.

Another Supplement Rules for Land Improvement Projects enacted in January, 1958 replaced the supplement rules with the same title enacted during the Japanese colonial regime and was enacted under the name of the Korean government. The subsidy rate decreased to 30% for arable land readjustment projects; but the rate for the other improvement projects remained the same as in the previous act, under which 50% of the rate applied; except for the additional provision to grant 100% subsidies to the project where the Minister of Agriculture and Forestry made the Federation of Irrigation Association conduct measurement and design.

Table 4-1 | The Developments of Government Subsidy Rates for Land Improvement Projects as Prescribed in the「Supplement Rules for Land Improvement Projects」 (1920-1961)

(Unit: %)

	The Supplement Rules for Land Improvement Projects (enacted in 1920)						The Supplement Rules for Land Improvement Projects (1958)
	1920-1939	1940-1945	1946-1949	1950	1951	1952-1957	1958-1961
Irrigation/drainage improvement	20	Large district: 55; small district: 50	50	30	80	50	50 or less
Reclamation	30[2]	Large district: 55; small district: 50	50	30	80	50	50 or less
Conversion of land category[1]	25	Large district: 55; small district: 50	50	30	80	50	50 or less
Conversion to rice paddy	30	30	50	30	80	50	50 or less
Arable land readjustment	-	30	50	30	80	50	30 or less
Under-drainage	-	30	50	30	80	50	30 or less
Small-scale land improvements	-	50 (25 from the state+25 from the province)[4]					
Measurement & design	-	-	-	-	-	-	100 or less

Notes: 1) Cultivated and converted its land category since 1940.

2) Government subsidy rate increased to 50% for reclamation project since 1929.

3) Large/small districts started to be divided since December, 1942; in 1940, however, it remained at 50% regardless of the scale.

4) 50% of subsidies to small-scale land improvement projects started to be granted since 1930.

Source: *The 20 history of land improvement*, the Federation of Land Improvement Associations, 1967, p.39, p.49, and p.178-179; the Supplement Rules for Land Improvement Projects; *the 45 history of the Korea's agricultural infrastructure development*, the Ministry of Food, Agriculture, Forestry and Fisheries, 1992, p.132, p.196 and p.897.

The military dictatorship, which took office by staging a coup in May, 1961, revoked any and all legislations that prescribed almost the same provisions even though those had been enacted under the Japanese colonial rule and newly enacted under the Korean government after the country gained its independence; and enacted new legislations. The new enactment, the 「Rules for Land Improvement Project Subsidies」 was enacted in August, 1962, with the same major provisions as the previous one; but to which machine purchase costs, test costs, confirmed measurement costs, and re-plotted land disposal costs were added and the subsidy rate increased from 50% to 70% for irrigation/drainage improvements, to 80% for land-filling/reclamation, and from 30% to 50% for arable land readjustment and under-drainage. The financial shortage in 1963 required amending the rules in January, 1963, under which those surged subsidy rates decreased from 1963: the subsidy rate remained at 80% for land-filling/reclamation, but the other rates decreased from 70% to 60% for irrigation/drainage improvements and cultivation projects and decreased from 50% to 40% for arable land readjustment and under-drainage.

Table 4-2 | The Developments of the Government Subsidy Rates for the Land Improvement Projects Conducted in 1960's and 1970's (1962-1985)

(Unit: %)

	The Rules for Land Improvement Project Subsidies			The Regulations for Agricultural Community Modernization Promotion Subsidies			
	1962	1963	1967	1970	1973	1976	1978
Irrigation/drainage improvements	70[1]	60	60[2]	70	70	70[3]	70[3]
Reclamation	80	80	80	80	80	80	80
Conversion of land category & cultivation	70	60	60	60	60	60	60
Arable land readjustment & under-drainage	50[1]	40	40	40	40	50	50
Arable land readjustment in special region	-	-	-	-	70	70	70
Measurement & design	100[1]	100	100	100	100	100	100
Development of underground water	-	-	-	100	100	100	100
Farm road	-	-	-	70	70	70	70
Cultivation of special region	-	-	-	-	100	100	100
Drainage improvement	-	-	-	-	-	100	100

	The Rules for Land Improvement Project Subsidies			The Regulations for Agricultural Community Modernization Promotion Subsidies			
	1962	1963	1967	1970	1973	1976	1978
Readjustment for the Large-scale Comprehensive Agricultural Development Project district	-	-	-	-	-	80	80
Development of simplified water to overcome drought damage	-	-	-	-	-	-	80

Note: 1) Not granted to areas with 10ha or smaller.

2) 70% subsidies granted to the project on areas with 50ha or smaller, which was not funded by the government.

3) Divided into: 70% for irrigation improvements and 100% for drainage improvements.

Source: The Rules for Land Improvement Project Subsidies & The Regulations for Agricultural Community Modernization Promotion Subsidies

In August, 1970, the 「Rules for Land Improvement Project Subsidies」 was revoked but the 「Regulations for Agricultural Community Modernization Promotion Subsidies」 was enacted, which was followed by the 「Land Improvement Projects Act」 replaced by the 「Agricultural Community Modernization Promotion Act」. The newly enacted act had almost the same major provisions, where the government subsidy rate increased from 60% to 70% for irrigation/drainage projects but the remaining subsidy rates stayed the same and only the 100% subsidy granted to the development project of underground waters for farming and the 70% subsidy given to the foundation of farm roads were added. There were no changes in expenditures, the basis to calculate the subsidy. Under the act, in 1973, the 70% subsidy for arable land readjustment projects on special region and the 100% subsidy for cultivation project as its construction costs on special regions were added. In 1976, the 100% subsidy for drainage improvement projects as its construction costs and the 80% subsidy granted to the readjustment for the Large-scale Comprehensive Agricultural Development Project district as part of the construction costs were added. Afterwards, in 1978, the 80% subsidy granted to the development projects of simplified water to overcome drought damage was added; and in February, 1981, the 70% subsidy rate remained for reservoirs but the subsidy for pumping stations increased to 85%; and in November, 1983, the subsidy rate granted to the general arable land readjustment increased from 50% to 60%.

The enactment of the 「Act on Budget and Management of Subsidies」 in 1986 brought momentum to reform the subsidy system for land improvement projects, under which the 「Regulations for Agricultural Community Modernization Promotion Subsidies」 was not revoked but suspended its effectiveness and finally revoked in 1995. Against this backdrop,

since 1986, the government subsidies granted to land improvement projects have not been subject to any separate provisions but included as a part of the projects implemented by each government agency that was given government subsidies and be subject to the act above. The 「Act on Budget and Management of Subsidies」 was amended from the whole provisions as specified in the 「Subsidies Management Act」 enacted in 1963, where the previous act only prescribed the matters in relation to the execution and management of subsidies, leading to a necessity to supplement the government subsidy system by adding the provision for budget compilation. The details of the amended provisions are as follow: ① the government selected any subsidy project conducted by local governments without prior consultation, which caused a lot of side effects; in this regard, the application system was introduced by which a subsidized entity submits the application for budget appropriation to the leader of any central institution and that leader must request the allocation of budget based on the application; ② the standard rate of subsidies was introduced, under which, in order for local governments to establish their own subsidized projects and to apply for budget appropriation for such subsidy amount, the subsidies granted to local governments shall be defined in its scope of application; and ③ the graded national subsidies ratio is introduced, under which the local governments, in particular the ones that suffer from financial shortage, can be subsidized with additionally prescribed ratios plus the standard one. ④ Leaders of local governments were obligated to provide funds for the local governments' share of the national assistance project in their budget with priority over other projects.

The 「Act on the Budgeting and Management of Subsidies」 was amended in December, 1996. The amendment included two major revisions. Firstly, the standard rate of subsidies for target projects that received government subsidies was narrowed in scope. The standard rate in the past was determined by the proportion of government subsidies including both government subsidies and the share of the local government for the fiscal year-to-date. However, the definition was changed to the proportion of government subsidies including government subsidies, the local government's portion, funds from national finance loans, the beneficiary's share, and other funds decided by the the Minister of Finance and Economy. Secondly, the project and the standard rate of subsidies for local governments, which were subject to receive government subsidies, were revised and supplemented. After that, the enforcement ordinance which was revised in May 2006, indicated that the standard rate of subsidies for the development of water projects increased from 50% to 80% for those living in farming and fishing villages. In the amendment tabled in April 2011, the standard rate of subsides for the renovation of locally managed breakwaters was newly established to be 70%. Also, the standard rate of subsidies for agricultural and fishery infrastructure development was newly set at 80%.

<Table 4-3> indicates the changing trends of the proportion of finances for the agricultural infrastructure projects from 1987 to the present. The characteristics of the trends are as follows. First, the government subsidy for the costs of agricultural infrastructure projects increased. In 1987, the government subsidy accounted for 70%-80% of the project expenses and granted an additional 10%-20% as a beneficiary charge (e.g. a small scale agricultural water development project, a water development project that protected against drought, an agricultural water reinforcement project, a field water development project, and a general Farmland Consolidation Project). However, the beneficiary charge was waived after 1997. Second, the number of agricultural infrastructure projects increased. The field oriented consolidation project and the Readjustment Project of Large Arable Land was implemented in 1994. The expansion and pavement for the improvement of farm roads project and the multipurpose agricultural water development project were introduced in 1995. The groundwater resource management project and the automation of agricultural water were introduced in the 2000's. Third, projects that had previously been subdivided, but were essentially the same were merged.

The farmland consolidation project includes general farmland consolidation, field-oriented development, the Readjustment Project of Large Arable Land, and the expansion and pavement for the improvement of farm roads. With regard to the general farmland consolidation, according to the enforcement ordinance, the standard rate of subsidies is fixed and 75% of the amount including the subsidies and the share of municipal government funding is appropriated for subsidy and 20% of the project expense is covered by beneficiaries. According to the enforcement ordinance that was revised in 1988, 70% of the total amount of project expenses are appropriated for subsidy and 10% is covered by beneficiaries and the rest is covered by local government. Since 1997, the General Farmland Consolidation Project was supported by government funding (80%) and municipal government funding (20%), but the project ended in 2004. Field oriented consolidation covered field water development, farm road renovation, and farmland consolidation. Since 1994, expenses for these projects were continuously supported by government funding (80%) and municipal government funding (20%). The Readjustment Project of Large Arable Land initiated the farmland consolidation a long time ago, however, the project also structured the irrigation/drainage channel and enlarged the size of farmland to point that would be considered 'large-scale farmland'. This farmland was unsuitable for the use of large agricultural machinery due to the fact that the irrigation/drainage channel was made of soil and the farmland was too small. The expense of the project is currently supported by government funding (80%) and municipal government funding (20%) and has been since 1994. The expansion and pavement for the improvement of farm roads project included the expansion and pavement of farm roads that were in the farmland consolidation area. The expense of this project was

supported by government funding (80%) and municipal government funding (20%) from 1995 to 2009, but after 2010 the ratios were changed to 70% and 30%, respectively.

Table 4-3 | The Rates of Government Subsidy for the Agricultural Infrastructure Improvement Project since 1987 (1987-2011)

(Unit: %)

	1987					1997				2006				2011			
	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Loan	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge
Mid/large-scale agricultural water development							100				100				100		
Reservoirs	100	70			30												
Pumping stations	100	85			15												
Underground dams	100	85			15												
Small-scale agricultural water development						Fixed amount				Fixed amount					70	30	
Surface water	70	70	20	10				100									
Groundwater							50	50									
Alluvial layer	70	70	20	10													
Bedrock layer	100	70	25	5													
Water development forprevention of drought																	
Small tubular well development[2]	100	80		20		100				100							
Portable water pumping facility[3]	70	80	10	10		80				80				80			

	1987					1997				2006				2011			
	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Loan	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge
Water supply lake	70	100															
Agricultural water reinforcement development																	
Surface water	70	70	20	10		100	100			100	100				70	30	
Groundwater																	
Alluvial layer	70	70	20	10													
Bedrock layer	100	70	25	5													
Field water development (Horticulture Production Complex)																	
Small tubular well	78	70	20	10													
Large tubular well																	
Alluvial layer	78	70	20	10													
Bedrock layer	74	70	25	5													
Farmland consolidation																	
General farmland consolidation (1965-2004)	75	60	20	6.7	13.3	80	80	20		80							
Field oriented consolidation (1994-)						80	80	20		80	80	20			80	20	
Readjustment project of large arable land(1994-)						80	80	20		80	80	20			80	20	

	1987					1997				2006				2011			
	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Loan	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge
Improvement of water supply (1975 -)	100	85			15	100	100			100	100			100	100		
Renovation of irrigation facilities	100	70			30		100				100				100		
Renovation of breakwaters																	
Nationally managed breakwaters	100	80			20	100	100			100	100			100	100		
Locally managed breakwaters							50	50			70	30		70	70	30	
Large-scale comprehensive agricultural development project (1970 -)		100					100				100				100		
The expansion and pavement for the improvement of farm roads project (1995 -)						80	80	20		80	80	20			70	30	
Multipurpose Agricultural Water Development (1995 -)							100				100				100		
The development of residential water in farming and fishing villages						50	50	50		80	50	50					
Water Reclamation projects (1985 -)		100					100				100				100		

	1987					1997				2006				2011			
	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Loan	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge	Standard rate of subsidies	Government funding	Municipal government funding	Beneficiary charge
Integrated maintenance of agricultural production infrastructure							90	10									
Groundwater resources management											100				100		
Automation of agricultural water management											100				100		
Survey of agricultural water quality											100				100		
Agricultural water quality improvement project															100		
Modification of agricultural and fisheries infrastructure														80	80	20	
Information on farming village water management											100				100		
Revision of the farming village water usage system											100				100		
Structural improvement of estuary weirs (2008 -)															100		

2012 Modularization of Korea's Development Experience
Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

Chapter 5

The Output and Effect of the Farmland Consolidation Project

The Output and Effect of the Farmland Consolidation Project

1. The Output of the Farmland Consolidation Project

1.1. The Performance of Survey and Design

1.1.1. Farmland Consolidation

Based on Clause 2, Article 6 of the「Rearrangement of Agricultural and Fishing Villages Act」, the Minister of Agriculture and Forestry established a basic plan for the project validating the agricultural infrastructure development after the venue survey. The details of the established basic plans were as follows: ① When more than 100ha of the agricultural infrastructure development project needed to be consigned, the Minister of Agriculture and Forestry defined the scope of the tasks and then conducted the basic survey. Based on the results of the survey, the basic plan would be confirmed. ② Given that the Farmland Consolidation Project was less than 100ha, the mayor or the head of a Gun conducted the basic survey, and the basic plan would be reviewed and confirmed according to the survey results . Moreover, according to the basic plan based on Article 7 of the「Rearrangement of Agricultural and Fishing Villages Act」, the Minister of Agriculture and Forestry and the appropriate governor could carry out the agricultural infrastructure development project by initially establishing the project implementation plan and confirming it. After that, the Minister of Agriculture and Forestry and the appropriate governor designated the project operator for the district concerned. Finally, the project proposal was sent to the project operator via the mayor and the head of a Gun.

The Agricultural Development Corporation (ADC) surveyed and designed development projects for agricultural water, river, and the drainage system for parallel districts. Since

1980, general construction and the basic survey were conducted for 238 districts (37,062ha). The detailed design had been initiated since 1972 and it was completed for 1,415 districts (187,065ha).

Table 5-1 | Performance of the Survey and Design by Year

(Unit: place, ha, %)

Classification	Basic Survey			Detailed Design		
	Number of Divisions	Area	Component Ratio	Number of Divisions	Area	Component Ratio
Total	238	37,062	100	1,415	187,065	100
Before 1970	-	-	-	656	85,490	46
1970s	-	-	-	378	41,930	22
1980s	95	15,748	42	185	29,744	16
1990s	123	21,314	58	196	29,901	16

Note: 1970s indicates the performance between 1972 and 1979. The 1990s indicates the performance between 1990 and 1998.

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 589

1.1.2. The On-Farm Road Improvement Projects

The project for the expansion and pavement of farm road improvements was targeted at areas where farmland consolidation had been completed. The project was to pave the major farming roads (with a width of more than 4m) and the unpaved farming roads (with a width of 3m) by using concrete or asphalt. In addition to this, the pavement was carried out for the roads that were too narrow for farm machinery to pass through. The earth canal of the farming road was to open culverts for construction. The priority criteria for selecting the target areas were places that included large and middle scale flat plains and fields in the agricultural development region, and could be secured by the municipal government in the large-scale Farmland Consolidation Project, and could have active resident participation in the community.

The project operator (mayor, the head of a Gun, the head of the Farmland Improvement Association) selected the target areas for the basic survey based on selection criteria and the selected areas were to be referred to the city or the governor. Then, the Agricultural Development Corporation (ADC) discussed the project with the project operator to conduct a basic survey. After that, the project operator became directly responsible for the detailed design which was applied using the rules based on the design and construction guidelines

for the farm road improvement projects, the road structure regulations, the regulations for structures and facilities of farming and fishing villages (Ministry of Government Administration and Home Affairs), and the design standards for agricultural infrastructure project plans.

Since 1995, the performance of the basic survey had been carried out over 2,100km every year and 2,585 districts in total (8,775km) were surveyed.

Table 5-2 | The Basic Survey Outputs for the On-Farm Road Improvement Projects by Year

(Unit: place, ha, km, %)

Classification	Number of Divisions	Beneficiary Area	State of Roads	Component Ratio
Total	2,585	355,490	8,775	100
1995	630	93,148	2,140	24
1996	609	91,585	2,173	25
1997	660	96,109	2,122	24
1998	686	74,648	2,340	27

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 591

1.2. The Performance of the Farmland Consolidation Project

1.2.1. The Performance of the Farmland Consolidation Project

Since 1964, the Farmland Consolidation Project had become substantially reinforced with institutional changes such as the increase of central government support, the reduction in the beneficiary's burden, and the readjustment project of large arable land. The 1960's was the initial phase to focus on grain support and landowners. In 1970, there was an increase in the rate of subsidies from the government and the establishment of the design standards and project plans. With this increase, the project was carried out to an annual average of more than 20,000ha. In the 1980's, government subsidies were adjusted and raised and the annual average of more than 90 billion won was invested to strengthen the projects. In the 1990's, the annual average of more than 27,000ha had been implemented to prepare for the Uruguay Round negotiations. Even the invested project costs were increased to an annual average of 620 billion won. In the early 1990's, the readjustment project of large arable land was conducted over eight districts (one district per province) of 1,016ha as a demonstration project. The project was improved by addressing the implementation problems and any other issues. Since the mid-1990's the project has been pursued in earnest.

Table 5-3 | The Chronological Farmland Consolidation Project Output

(Unit: place, ha, million won, %)

Classification	Number of Divisions	Area		Project Cost	
		Area	Component Ratio	Price	Component Ratio
Total	9,539	722,910	100	6,636,660	100
1960s	1,286	84,153	12	8,349	1
1970s	1,749	201,732	28	103,055	6
1980s	2,042	188,249	26	934,790	18
1990s	4,462	248,776	34	5,590,466	75

Note: The 1960's indicates performance between 1964 and 1969. The 1990's indicates performance between 1990 and 1998.

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 592

Table 5-4 | The Output of Farmland Consolidation Projects by Year

(Unit: place, ha, million won)

Year	Number of Divisions	Area	Financial Resources			
			Total	National Funding	Municipal Government	Landowner
Total	9,539	722,910	6,636,660	4,418,034	1,452,532	266,094
1960s	1,286	84,153	8,349	3,630	1,711	3,008
1964	214	4,378	224	16	43	165
1965	209	10,362	602	283	87	232
1966	297	18,621	1,344	518	269	557
1967	228	18,067	1,714	603	471	640
1968	174	17,056	2,198	1,117	390	691
1969	164	15,669	2,267	1,093	451	723
1970s	1,749	201,732	103,055	49,507	31,182	22,366
1970	149	13,423	2,231	859	698	674
1971	149	16,327	3,043	1,520	822	701
1972	230	24,662	5,672	2,678	1,439	1,555
1973	201	21,247	5,367	2,489	1,600	1,278
1974	234	30,920	8,196	3,770	2,503	1,923

Year	Number of Divisions	Area	Financial Resources			
			Total	National Funding	Municipal Government	Landowner
1975	203	22,289	10,004	4,797	2,976	2,231
1976	161	20,745	10,988	5,411	3,274	2,303
1977	149	23,077	15,099	7,593	4,408	3,098
1978	146	15,874	17,976	8,913	5,410	3,653
1979	127	13,168	24,479	11,477	8,052	4,950
1980s	2,042	188,249	934,790	571,382	206,026	157,382
1980	122	12,573	35,625	17,211	11,260	7,154
1981	121	14,475	45,700	22,803	13,536	9,361
1982	123	17,057	61,688	20,983	18,532	12,173
1983	102	14,994	63,167	35,475	15,017	12,675
1984	121	15,978	64,697	38,436	13,217	13,044
1985	137	18,014	73,689	43,868	15,194	14,627
1986	169	20,195	102,823	61,235	20,725	20,863
1987	219	20,990	126,174	76,501	25,274	24,399
1988	468	28,104	171,740	112,968	34,860	23,912
1989	460	25,869	189,487	131,902	38,411	19,174
1990s	4,462	248,776	5,590,466	3,793,515	1,213,613	83,338
1990	671	31,563	301,817	208,642	63,642	29,533
1991	473	20,899	241,698	170,075	48,285	23,338
1992	494	21,273	319,044	224,275	64,302	30,467
1993	416	19,211	351,249	276,904	74,345	-
1994	355	17,982	337,094	228,870	108,224	-
1995	557	29,881	620,807	461,198	159,609	-
1996	468	37,810	927,292	727,370	199,922	-
1997	510	37,590	1,028,319	795,398	232,291	-
1998	518	52,568	963,144	700,781	262,363	-

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 593

1.2.2. The Performance of the Expansion and Pavement of the Farm Road Improvement

Farming roads were constructed through the Farmland Consolidation Project. However, due to unpaved roads, there were challenges with farming machinery operations, produce damage in transit, and the reduction of labor productivity. Hence, expansion and pavement was inevitable for farm road improvements. Accordingly, the government conducted the expansion and pavement of the main and branch lines of farming roads in the areas where farmland consolidation was completed. The capability for the transit between production facilities, processes, and the distribution of the product was enhanced to increase the farmer's income, and expansion plans and pavement were implemented for the improvement of living environments in farming and fishing villages since 1995 (22,000km).

Table 5-5 | The Chronological Output for the On-Farm Road Improvement Project

(Unit: place, km, million won, %)

Classification	Quantity of Project		Project Cost	
	Actual Number	Component Ratio	Invested Money	Component Ratio
Total	5,608	100	560,660	100
1995	200	4	18,700	4
1996	1,308	23	126,180	24
1997	2,000	36	202,800	37
1998	2,100	37	212,980	35

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 595

2. The Effects of the Readjustment Project on Arable Land

2.1. The Effects of Farmland Consolidation

2.1.1. Direct Effects

The Farmland Consolidation Project affects the cost reduction of rice production because of the reduced hours of labor input and the efficient use of middle to large-scale machinery. In order to verify such effects, the Rural Community Corporation investigated the effects of the increased yield of rice, the reduced effects of the labor force, the reduced effect on

production costs, and the effects of the increasing use of land in the 20 sample districts, where the detailed survey was conducted and among 50 districts in total where the projects were completed in the late 1990's.

① The effect of the increased yields of rice: the amount of rice production per 10a on average of the surveyed district increased by 65kg (15.1%) from 430kg (before farmland consolidation) to 495kg (after farmland consolidation, 1996). On the other hand, the average of increased yields of the city and gun districts among the surveyed districts increased by 10.1% (from 456kg to 502kg) during the same period.

Table 5-6 | The Increased Yields of Rice per 10a of Farmland Consolidation

(Unit: kg, %)

Classification	Surveyed District City/Gun Average (A)	Surveyed District Farming Family Average (B)	Variation (B-A)
Before	456	430	△26
After	502	495	△7
Increase Of Crop Amounts	46	65	19
Increased Yield Rate	10.1	15.1	5.0

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 615

With regard to the Farmland Consolidation Project, the Rural Community Corporation and other research institutes analyzed the effects of the increase of rice production as well. According to the findings from the Rural Community Corporation, the increased yield of rice led by the Farmland Consolidation Project was 13.6%. Also, the findings from the Farmland Improvement Association indicated a figure of 15.1%. Finally, the Korea Development Institute (KDI) estimated a result of 3.5%.

② The reduction effects of the labor force: In order to analyze the reduction effects of the labor force resulting from the Farmland Consolidation Project, the direct working time was calculated. The working time is divided into 13 phases ranging from nurseries, hotbeds and drying to estimate reduction effects of the labor force. The direct working time made up a large portion of the total labor input time. According to the survey results from 20 sample districts, the work to significantly reduce labor time was focused on irrigation and drainage canal management, the installation of seed beds, main paddy plowing and leveling, rice transplanting, harvest and threshing. These works accounted for more than 91% of the saved labor time in total.

Table 5-7 | The Reduction Effects of the Labor Force per 10a of the Farmland Consolidation Project

(Unit: hours, %)

Classification	Before		After		Reduced Time		Variance
Total working hours	44.9	(100.0)	29.9	(100.0)	△15.0	(100.0)	△33.4
Preparation for seed	0.6	(1.6)	0.5	(1.7)	-	-	△16.7
The installation of the seed bed	8.3	(18.5)	7.0	(23.4)	△1.3	(8.7)	△15.7
Main paddy plowing/ leveling	4.6	(10.2)	2.2	(7.4)	△2.4	(16.0)	△52.1
Application of fertilizer	0.6	(1.3)	0.8	(1.7)	△0.1	(0.7)	△16.7
Rice transplanting	6.4	(14.3)	4.4	(14.7)	△2.0	(13.3)	△31.3
Application of additional fertilizer	0.7	(1.6)	0.6	(2.0)	△0.1	(0.7)	△14.2
Main paddy weeding	1.5	(3.3)	1.2	(4.0)	△0.3	(2.0)	△20.0
Main paddy management	13.2	(29.4)	6.7	(22.4)	△6.5	(43.3)	△49.2
Disease and pest control	2.5	(5.6)	1.8	(6.0)	△0.7	(4.7)	△28.0
Harvest and threshing	3.9	(8.7)	2.4	(8.0)	△1.5	(10.0)	△38.5
Drying	2.6	(5.8)	2.5	(8.4)	△0.1	(0.7)	△3.8

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 616

Other research institutes analyzed the reduction effects of labor forces for readjustment projects of arable land. According to findings from the Rural Community Corporation, the reduction effect of the labor force was 30.7%. Also, the findings from the Farmland Improvement Association showed 33.4%. The Korea Development Institute (KDI) estimated the results at 14-23%. Finally, the Ministry of Agriculture and Forestry indicated a figure of 23%.

③ The effects of the increasing rate of arable land utilization: The rate of arable land utilization in Korea began with around 150% in the 1960's and the rate decreased over time to 109.8% in 2011. Specifically, the rate of utilization of rice paddies has decreased from 140% to 106% since it reached a peak of 143% in 1968. The rate of double cropping in rice paddies has increased by 6.4% from 4.7% (before farmland consolidation) to 11.1% (after farmland consolidation). For example, barley increased by 5.3% from 3.6% (before farmland consolidation) to 5.3% (after farmland consolidation). The increased rate of double cropping of the paddy was caused by farmland consolidation because the transportation of

farming materials and produce became more convenient over time due to the expansion and pavement of farming roads in low swampy and submerged areas.

Table 5-8 | The Effects of the Increasing Rate of Utilization of Paddy by Farmland Consolidation

(Unit: %)

Classification	Before	After	The rate of increase
Rice farming	100.0	100.0	-
Double cropping	4.7	11.1	6.4
- Barley	3.6	8.9	5.3
- Facility horticulture	1.1	2.2	1.1
Rate of the utilization of paddy	104.7	111.1	6.4

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 618

④ the reduction effects of rice production costs: Due to the readjustment projects of arable land, the reduction effects of rice production costs in 20 surveyed sample districts decreased by 88,931 won from 550,452 won (before) to 461,521 won (after). Moreover, rice production costs per 80kg decreased by 27,820 won from 102,410 won (before) to 74,589 won (after).

The savings rate of rice production costs per 80kg was higher than that of the cost per 10a because of the effects of reduced production costs and increased cutoff of the water supply due to farmland consolidation.

Table 5-9 | The Reduction Effects of Rice Production Costs of the Farmland Consolidation Project

(Unit: won, kg, %)

Classification	Before	After	Variance	Variance Rate
Production cost per 10a (A)	550,452	461,521	△88,931	△16.2
Cutoff of the water per 10a (B)	430	495	65	15.1
Production cost per 80kg (A÷B)	102,410	74,589	△27,820	△27.2

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 619

⑤ The effects of the increasing profitability of rice: the gross profit per 10a of 20 survey sample districts increased by 36,142 won (5%) from 722,830 won (before the Farmland Consolidation Project) to 758,972 won (after the Farmland Consolidation Project). The net income of rice per 10a had increased by 125,073 won (72.6%) from 172,378 won (before) to 297,450 won (after). The income for rice per 10a increased by 59,979 won (11.2%) from 597,357 won (before) to 297,450 won (after). The agricultural income rate, which represents the ratio of the income for rice to the gross profit for rice increased from 78.7% (before) to 74.3% (after).

Table 5-10 | The Net Income of Rice per 10a and the Variance of Income of the Farmland Consolidation Project

(Unit: won, %)

Classification		Before	After	Variance	Variance Rate
Gross profit (A)		722,830	758,972	36,142	5.0
Cost	Production cost (B)	550,452	461,521	△88,931	△16.2
	Management cost (C)	185,452	161,615	△23,837	△12.9
Profitability	Net income (D=A-B)	172,378	297,450	125,073	72.6
	Income (E=A-C)	537,378	597,357	59,979	11.2
Income rate (G=E/A)		74.3	78.7	4.4	

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 620

2.1.2. Indirect Effects

① The effects of increasing land value: as the land values of rice paddies increases due to the Farmland Consolidation Project, the value of the farmland assets of farming families also increases. According to the variance of the land value of rice paddies in 20 survey sample districts, the value increased by 31.8% from 20,380 won (before) to 26,870 won (after). With regard to the type of farmland consolidation, the price of rice paddies for general farmland consolidation districts were high before and after the project, because there were numerous districts in the middle. The rate of the rising land value showed that the rate of the rise of large- scale divisions (36.8%) was higher than that of the regular divisions (28.1%). By regions, the price of rice paddies was low in the plains. On the other hand, the rate of the rise in land value was 35.1%, which was higher than that of the hilly and mountainous regions (29.7%). Moreover, when it came to the changes of land value by area, indications showed that the land value in the south was higher than that in the

central areas. As the south was a plain area featuring lots of large-scale divisions and double cropping, the productivity of rice paddies was high.

Table 5-11 | The Changes of Land Value before and after the Farmland Consolidation Project (1996)

(Unit: won, %)

Classification		Before	After	Variance	Variance Rate
Average		20,380	26,870	6,490	31.8
Types	Regular	22,110	28,319	6,209	28.1
	Large scale	18,478	25,275	6,797	36.8
Regions	Plains	16,853	22,765	5,912	35.1
	Hilly and mountainous	23,587	30,601	7,014	29.7
Areas	South	14,873	20,376	5,503	37.0
	Central	25,386	32,773	7,386	29.1

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 621

② The effects of environmental conservation: farmland consolidation, involving river improvements, irrigation developments, and reservoir improvements, led to various effects regarding public service and convenience. <Table 5-12> below represents the effects of environmental conservation for rice farming.

Table 5-12 | The Effects of Environmental Conservation for Rice Farming

(Unit: 100 million won)

Classification	Flood prevention	Water resource development	Water purification	Reduction of the loss of soil	Waste disposal	Air Purification	Total
Minimum	1,064	5,879	4,993	528	391	18,615	31,460
Maximum	8,655	9,839	12,325	992	391	46,246	78,448

Sources: Korea Rural Economic Institute, Study on the effect of rice farming on environmental conservation, 1995

③ The effects of the change on local residents' perceptions: farmland consolidation resulted in increased convenience of farming activities, an increase in the utilization of farming machinery, and the reduction of labor input time. Hence, the perception of the farmers has changed. According to the survey result, 44.0% of the target farmers wanted to farm. On the other hand, 28.3% responded that there was no change in their mind to

farm before and after the Farmland Consolidation Project. Therefore, this result implies that more farmers were motivated to farm due to the improved farming conditions achieved through farmland consolidation.

Farmland consolidation resulted in the development of farming roads, the expansion of farmland division, and the convenience of farming through the utilization of large farming machinery. Also, as farming machinery ownership increased and the sizes of these machines became larger, 63% of the farmers surveyed were willing to increase the size of their farms. In particular, most of the farmers under the age of 50 were willing to expand their farm sizes and they wanted their lots to be 20,000-30,000 pyeong. After farmland consolidation, the enlargement of farm sizes resulted from the increase of both farmland purchases and leased areas. According to the survey, the overall increase of farm size was 22.5%, and the decreased result was 2.7%.

Table 5-13 | The Change of Farm Size after the Farmland Consolidation Project

(Unit: household, %)

Classification	Slightly increased		Greatly increased		Same		Decreased		None		Total	
Total	98	(14.9)	50	(7.6)	281	(42.8)	18	(2.7)	210	(32.0)	657	(100.0)
Farmland purchase	54	(16.3)	15	(4.5)	175	(52.7)	16	(4.8)	72	(21.7)	332	(100.0)
Leased area	44	(13.5)	35	(10.8)	106	(32.6)	2	(0.6)	138	(42.8)	325	(100.0)

Sources: Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 622

2.2. The Effects of the On-Farm Road Improvement Projects

The effects of the farm road improvement project can be divided into positive and negative effects. The positive effects included enhanced distribution, quality improvements, production cost reductions, farming convenience improvements, maintenance expense reductions, improved living environments, the increase of urban and rural interchanges, the stability of the local community, resource developments, and relevance to other businesses. The negative effects include damage to the ecosystem, an increase in traffic accidents and difficulties in establishing temporary measures for farming roads.

2.2.1. Positive Effects

① The effects of distribution enhancement: due to the farm road improvement project, the available amount has been increased for transport vehicles such as cultivators, tractors, and trucks. According to survey results from the Korea Rural Community Corporation (KRC), in the case of rice, one light truck can load one ton on the paved farming road. On the other hand, only 0.74 tons can be loaded on to the unpaved farming roads.

Moreover, the farm road improvement project can reduce shipping times. The reduced shipping times can be divided into two factors: the increasing transportable quantity of transport vehicles and the reduction of transit time. The former is related to the pavement of the roads, resulting from the fact that the given amount of work can be transported in a short time because a greater amount of produce can be transported by the same transport vehicles. Due to the paved roads, the latter results from the increased speed of transportation vehicles.

Table 5-14 | A Single Load by Crop and by Transport Vehicles

(Unit: Mt/vehicle)

Crops	Unpaved road										Paved road				
	Poor road					Regular road					Pavement (1st lane)				
	Cultivator	Tractor	Truck			Cultivator	Tractor	Truck			Cultivator	Tractor	Truck		
			Small	Middle	Large			Small	Middle	Large			Small	Middle	Large
Rice	0.51	0.78	0.56	1.20	2.11	0.68	1.04	0.74	1.60	2.81	1.00	1.60	1.00	2.50	4.50
Barley	0.48	0.60	0.54	1.20	1.80	0.64	0.80	0.72	1.60	2.40	0.94	1.23	0.97	2.50	3.85
Corn	0.41	0.56	0.42	0.96	1.56	0.54	0.74	0.56	1.28	2.08	0.80	1.14	0.75	2.00	3.33
Beans	0.41	0.56	0.42	0.96	1.56	0.54	0.74	0.56	1.28	2.08	0.80	1.14	0.75	2.00	3.33
Onion	0.39	0.78	0.54	0.79	1.72	0.52	1.04	0.72	1.06	2.30	0.73	1.60	0.97	1.65	3.68
Highland pepper	0.36	0.72	0.56	0.82	1.80	0.48	0.96	0.74	1.10	2.40	0.71	1.48	1.00	1.71	3.85
Highland strawberries	0.51	0.77	0.54	1.11	1.80	0.68	1.02	0.72	1.48	2.40	1.00	1.58	0.97	2.31	3.85
House pepper	0.40	0.61	0.56	1.03	1.72	0.54	0.81	0.74	1.38	2.30	0.79	1.24	1.00	2.15	3.68
House cucumbers	0.40	0.61	0.56	0.79	1.72	0.54	0.81	0.74	1.06	2.30	0.79	1.24	1.00	1.65	3.68
House Strawberry	0.51	0.76	0.54	1.11	1.80	0.68	1.01	0.72	1.48	2.40	1.00	1.55	0.97	2.31	3.85
House melon	0.51	0.76	0.54	1.11	1.80	0.68	1.01	0.72	1.48	2.40	1.00	1.55	0.97	2.31	3.85

Crops	Unpaved road										Paved road				
	Poor road					Regular road					Pavement (1st lane)				
	Cultivator	Tractor	Truck			Cultivator	Tractor	Truck			Cultivator	Tractor	Truck		
			Small	Middle	Large			Small	Middle	Large			Small	Middle	Large
House watermelon	0.48	0.72	0.51	1.11	0.95	0.64	0.96	0.68	1.48	2.60	0.94	1.48	0.91	2.31	4.17
Mushrooms	0.45	0.68	0.48	1.06	2.00	0.60	0.90	0.64	1.41	2.67	0.88	1.39	0.86	2.20	4.28
Apple	0.48	0.72	0.51	1.08	1.80	0.64	0.96	0.68	1.44	2.40	0.94	1.48	0.91	2.25	3.85
Grapes	0.36	0.54	0.39	0.82	1.80	0.48	0.72	0.52	1.10	2.40	0.71	1.11	0.70	1.71	3.85

Note: Truck sizes are as follows:, small truck is 1-ton, medium-sized truck is 2.5 tons, and a large truck is more than 4.5tons.

Sources:Rural Development Corporation (RDC), Comprehensive bibliography on the agricultural infrastructure project, 1999, p. 629

The level of connectivity between the related facilities for produce distribution, such as a collection place for the loads, RPC, previously unavailable, have increased through the farm road improvement project. The main goal for the project was to promote the process and distribution, and involved the expansion and pavement of farm roads between the facilities for produce processing and distribution, which were connected to major farm roads in farmlands where the farmland consolidation had been either completed or planned.

Large farm machinery previously unavailable could now be used because of the farm road improvement project and this was one of the contributing factors that made large-scale farming possible. It reinforced the convenience of farming and became a political basis for the large scale of family farming.

② Quality improvement: as conditions of production and distribution, such as the reduction of wear and loss rates of produce, have improved due to the farm road improvement project, produce unavailable in the past could be produced and the cropping system could also be improved by using highly profitable kinds of crops. Since the current ongoing project is supposed to be based on small scale units in rice paddy oriented areas, it seems to be difficult to achieve the contributing effects for the improvement of the cropping system. Nevertheless, if the entry roads are to be paved by the field infrastructure development project, highly profitable crops can possibly be cultivated in the fields and orchards in the hilly and mountainous areas where the cultivation of crops for special purposes was not possible in the past.

Moreover, the farming road development project can address problems regarding the reduction of the quality produce caused by dust damage before the implementation of the project. It is related to the improvement of produce quality due to the increasing amount of sunshine. Such effects become strong in facility horticulture areas. On the other hand, it is considered minor in a single crop area for rice.

③ The reduction effects of production costs: the farm road improvement project influences the reduction of transit time for farm machinery and the labor force. The reduction of time leads to reduced production costs. As the transit time per unit distance by vehicle types is saved in major farming works (plowing, leveling, compost transport, fertilization, weeding, harvest, and transport), the total amount of time spent on farming can be saved and the farming efficiency per unit of time can be also improved.

Additionally, as the surface of the farming roads is enhanced by the farm road improvement project, the wearing loss rate and the frequency of the breakdown of farm machinery and vehicles can be decreased. Depreciation costs and repair expenses are minimized and production costs savings and persisting periods of farm machinery can be extended.

④ Farming convenience improvement: The farm road improvement project can decrease traffic accidents caused by rollovers and inexperienced driving, which occurred when elderly farmers operated farming machinery, such as cultivators and handcarts, on farming roads with poor surfaces before the project was implemented.

Also, in the case of large facility crops of which quality depends on farmer's efforts, the farmers can devote their efforts to farming because their access to the farmland is improved, yet another positive effect of improving the quality of produce.

In addition, paved farming roads can be used as a sun drying areas for produce. Because of this, instead of using dryers, peppers can be sun-dried so that they can be sold at a higher price. Hence, these effects can partially improve the farming convenience and the quality of produce.

⑤ The reduction of maintenance expenses: the reduction of labor costs and materials and equipment input costs was spent on farming road maintenance and reinforcement works for the loss of roads before the farm road improvement project had been carried out. The work for waterway dredging can be decreased because the sediment influx to waterways is decreased due to the farming road pavement. There is also another cost reducing effect related to the effectiveness of vibration reduction for the facilities such as vinyl greenhouses and glass greenhouses.

⑥ The improvement of the living environment:

It was uncomfortable to use vehicles such as bicycles and motorcycles due to the poor condition and surface of farming roads before the project was implemented. However, the farm road improvement project reduces these difficulties in using such vehicles.

Also, the farm road improvement project improves the accessibility to other villages and neighborhood living facilities through the connection of farmland to villages, main roads, and facilities for farming convenience.

In particular, farm road development can improve the ability for children to commute to nearby schools, as well as improving access to the RPC, the collection place of loads, the National Agricultural Cooperative Federation, and administrative facilities such as the Eup office, and the Myeon office.

⑦ The improvement of urban and rural interchange: The farm road improvement project can improve the accessibility to rural areas so that city dwellers can easily access rural areas. It can also partially result in the influx of non-farmers to rural areas.

⑧ The stability of the local community: The farm road improvement project enhances farming convenience and the rural living environment to encourage people to settle in rural areas. As a result, the social costs are reduced by the declining numbers of people leaving rural areas.

⑨ Resource development: the farm road improvement project promotes the efficient use of resources in the areas adjacent to the roads. As most of the projects in progress have been in areas of the agricultural development region and farmland consolidation region, this can be effective in preventing the abandonment of farmlands. Moreover, the slope areas of both sides of the road, which had been difficult for use before the project, are now available for use. This can lead to the creation of land due to the improved utilization of land resources.

2.2.2. Negative Effects

Due to the farm road improvement project, the habitat of the wildlife that used to live in the farming road before the project have been damaged and the movement of organisms, such as frogs, and earthworms have been also been restricted. Moreover, such creatures have been crushed to death because of farm machinery and automobiles.

Additionally, as the surface of the farming road was paved, there have been increasing traffic accidents due to the overloading and speeding of farm machinery and transport vehicles. These accidents are more likely to occur in large-scale project areas where there are a larger number of pieces of long equipment and increased traffic of automobiles.

In the case of the abnormal changes of weather such as a localized torrential downpour, it could be difficult to establish countermeasures such as the construction of temporary drainage canals, due to the farming road structures with cement.

2012 Modularization of Korea's Development Experience
Farmland Utilization and Improvements for Agricultural Production Infrastructure: Farmland Consolidation

Chapter 6

Summary and Implications

Summary and Implications

a. Significance of the Farmland Consolidation Project

Farmland consolidation is the act of consolidating a series of fragmented and irregular farmland plots to enlarge plot sizes and support sufficient irrigation. Farmland consolidation also combines and groups the proprietor's farmland into one area by administrative give-and-take as well as division-and-junction of their replotted land. Moreover, it also includes the readjustment of farmland, which is small or lacks sufficient infrastructure due to farmland consolidation or earthwork waterways projects that were done in the past. Such areas can be reconsolidated into a larger scale production by employing farm machinery. Therefore, the project is involved in ①the standardization and scaling of traditional plots which have been fragmented or are irregular in shape, ② the enlargement of farm size to a scale that is suitable for large farm machinery, ③ the modification of irrigation and drainage canals for improving the efficiency of water management, ④ the construction, expansion, and modification of farm roads to be more easily accessible to farm machinery, ⑤ the improvement of soil layers for securing a plow layer, such as soil conditioning and soil covering, ⑥ the site renovation for public agricultural facilities (e.g., collection place of loads or the location of a drying apparatus).

The purpose of farmland consolidation is to increase agricultural productivity and to reduce production costs. The effects can be classified as direct and indirect. The direct effects are as follows: an increased supply of water, a reduced labor force, an increased rate of arable land utilization, reduced production costs, increased profitability, and reduced expenses relating to water loss and maintenance. The indirect effects include the enhancement of public interests like environmental conservation, prevention of natural disasters through the improvement of drainage systems, and the improvement of transit facilities. Also, another indirect effect relates to the changing perspective of farmers who

are increasingly wanting to expand the scale of their farming and strengthen their settlement in rural areas.

b. Implementation Period of the Farmland Consolidation Project and Its Background

The first agricultural infrastructure project in Korea was conducted during the Japanese colonial era (1910-1945). Its features can be summarized as follows. First, the Land Improvement Projects were implemented by receiving strong support from the country with the irrigation association as its center of support. Second, the Land Improvement Projects were continually promoted for long-term periods in accordance with the 'increased yield of rice' plan that was supposed to solve the food problems in Japan. Third, the Land Improvement Projects still focused on the development of agricultural water and farmland. However, the Farmland Consolidation Project was first conducted by the Joseon increased yield of the rice plan in 1940. Fourth, even though the Land Improvement Projects aimed at high yields of rice, the lack of food in the country was aggravated because most of the rice yields were exported to Japan, rather than feeding the Korean people.

With the defeat of Japan in August 1945, the U.S. military entered South Korea while the Soviet Union was stationed in North Korea. After a long war the two Koreas were separated. In August 1948, the Government of the Republic of Korea was established, ending the three-years of U.S. military administration. However, the Korean War broke out as North Korea invaded South Korea in June, 1950. The war lasted for three years until the armistice was signed in July, 1953. Despite being liberalized from the colonial rule of Japanese imperialism for 36 years, South Korea suffered separation from the rest of its people and the ravages of the Korean War. For these reasons, South Korea could not find a way to avoid being the poorest country in the world, until 1950. In this period South Korea received assistance from foreign countries, but still strived to recover the agricultural production infrastructures that had collapsed because of the war and focused on increasing food production. The agricultural infrastructure project had been sustained, focusing mainly on the agricultural water development project. Nevertheless, the scale of the project had been small due to the lack of material and financial difficulties.

The dictatorship that ruled South Korea for 12 years began when after the established Government of the Republic of Korea collapsed. This was brought on by the student-led demonstration that occurred throughout the country on April 19, 1960. After that, the military regime established itself by a coup in May, 1961. The military regime replaced and discarded all of the conventional laws that had been observed during the Japanese colonial era. Moreover, the first five-year plan for economic development was announced in July and the plan came into effect in 1962. Finally, South Korea achieved drastic economic

development, having an average annual GDP growth of 8.4% for 10 years (1961-1970). This was especially notable since the past eight years (1954-1961) had seen only modest growth of 4.1%. Specifically, the mining and manufacturing industries grew 15.7% annually, while agriculture, forestry, and fishery industries increased by only 4.4%. Specifically, the industries of agriculture, forestry, and fisheries decreased from 39% (1961) to 29% (1970). On the other hand, mining and manufacturing industries increased from 16% to 20% over the same period.

Since the establishment of the Government of the Republic of Korea, the Farmland Consolidation Project was first carried out in Gyeongsangbuk-do in 1964. The project was selected by the central government in 1965 and began its expansion throughout the country. At that time, 62% of the total agricultural output was rice production, while 9% was barley production. This indicates that the agricultural production system was mainly based on rice and, to a lesser extent, barley. The rice production per unit of area was low at about 300kg per 10a. The total number of agricultural machinery distributed was 2.5 million nationwide where farming families had approximately 1,000 cultivators, 26,000 water meters, and 19,000 power threshers. The total area of paddies that had an irrigation system installed was 701,000ha (55%) of the total paddy area (1,286,000ha). The demand for the development of agricultural water was the highest out of all of the agricultural infrastructure projects. In addition, the distribution rate of agricultural machinery was extremely low. Farming households were overpopulated with regard to the fact that farming families made up 52% of the total households and the farming population was 55% of the total population and there was no demand for farmland consolidation from farming families in 1965. However, the local administrative offices forced the people into conducting the Farmland Consolidation Project by using their government authority. Moreover, the proportion of national subsidies for farmland consolidation projects were extremely low when the project was introduced. Hence, farming households were against the farmland consolidation project because they thought the project caused adverse effects such as the decreasing size of farming area and the changing location of farmland. Despite the opposition of farmers, local administrative offices had to put every effort into implementing the project.

In order to successfully carry out the Farmland Consolidation Project with farmers' demands and their active responses it had to be done at a time when the population of farming households decreased and large agricultural machinery could be widely distributed. Moreover, it is also appropriate to conduct the project when there is not too much demand for agricultural water development projects from farmers because the development of agricultural water, which has the greatest impact on the agricultural production, may reach above a certain level. If the local administrative offices want to lead the Farmland Consolidation Project before these conditions mentioned above are met then implementation

procedures, organization, method, and especially financial assistance should be required in order to minimize the resistance and opposition of farmers.

c. The Development Process of the Farmland Consolidation Project

The first Farmland Consolidation Project in Korea was implemented for the sake of Increased Yield of Rice-Plan (1940) by Japan. The initially proposed size in the plan was 13,000ha but was expanded to 66,000ha by the Joseon Increased Yield of Rice-Revision Plan (1942) and in 1945, the project size was to decreased to 24,000ha. After Korea gained independence, the Farmland Consolidation Project was initially implemented by Gyeongsangbuk-do (1964) with 247 districts (5,806ha). Since 1965, the projects were conducted by the government. During the 1960's more than 50% of the total cost of readjustment projects relied on the efforts of the farmers. Also, investments were covered by their own grain and the municipal government. For these reasons, the plan was severely opposed by farmers. The farmers' perception of farmland consolidation was changed in a positive way in the 1970's, when the project scale was expanded up to about 25,000ha and financial support also increased with the central government contributing 50%, the municipal government contributing 30%, and landowner contributing 20%. As farmland consolidation became the core project for agricultural production infrastructure improvement in the 1980's the total expense and scale of the project was also expanded. The scale of the project was initially 12,000ha per year, but was increased by more than 20,000ha, reaching 24,681ha with 200.9 billion won in funding by 1989. Aside from the general Farmland Consolidation Project, in the 1990's many other projects have been implemented including: field-oriented modification projects, and readjustment projects of large arable land, improvement of farm roads projects. During the next decade, the general Farmland Consolidation Project was discontinued in 2004 with 721 thousand hectares.

The characteristics of the development process of the Farmland Consolidation Project, which has been currently conducted since 1964 are summarized as follows.

First, the project volume has been gradually expanded. The annual average areas where farmland consolidation was implemented were 14,000ha (1960's), 20,000ha ranging from 13,000 to 31,000ha (1970's), 19,000ha ranging from 13,000 to 28,000ha (1980's), 29,000ha ranging from 18,000 to 53,000ha (1990's), and 8,000ha ranging from 3,000 to 17,000ha (2000's).

Second, the kinds of the Readjustment Projects of Arable Land have been diverse and its range has expanded. The field-oriented modification project, and the Readjustment Project of Large Arable Land were introduced in 1994. The expansion and pavement for the improvement of farm roads project was introduced in 1995. The target area of farmland consolidation was expanded from paddies to fields. The size of the farmland consolidation

section was expanded from a small block to a large block. The expansion and pavement of farm roads was added as a result of clustering farmland and the renovation of irrigation/drainage channels. In addition to the physical renovation of farmland, the project aimed to improve the agricultural structure relating to things like the grouping of farmland and the expansion of the scale of farms. Third, the assistance system for the Farmland Consolidation Project was expanded and supplemented. The rates of government subsidy for the Farmland Consolidation Project were 30% (Japanese colonial era), 40% (1960's-early 1970's), and 50% (late 1970's-early1980's). From the late 1980's to the early 1990's, government funding was 60%; municipal government funding was 20%; the charge to the beneficiary was 20%. After the late 1990's, government funding was 80% and municipal government funding was 20%, meaning that the beneficiary charge was waived.

d. Implementation System of the Farmland Consolidation Project

To implement the Farmland Consolidation Project policy, the relevant organization, procedures, and financial assistance must be prepared. The relevant legislation including farmland consolidation refer to the ordinances that define the overall agricultural infrastructure project, such as the 「Land Improvement Project Law」 (1960's) and the 「Agricultural Community Modernization Promotion Act」(1970's and 1980's). After 1995, the agricultural infrastructure project was conducted, based on the 「Rearrangement of Agricultural and Fishing Villages Act」. Financial assistance for the agricultural infrastructure project was based on 「Regulations of Land Improvement Project Subsidy」 (1960's), 「Regulations of Agricultural Modernization Promotion Project Subsidy」 (1970's-early 1980's), and the 「Act on the Budgeting and Management of Subsidies」 (1986-present). The names of the project operators for the Farmland Consolidation Project were changed from the Japanese colonial era to the present, depending on the national government, the local government, and the time period. However, they have not changed for landowners, the unions and public corporations in charge of agricultural infrastructure projects. Also, the participants in the Farmland Consolidation Project remained the same as the person who has ownership of the land on which the Farmland Consolidation Project is conducted.

The implementation procedures of the Farmland Consolidation Project had been slightly different until 1994, depending on the types of project operators. However, the basic procedures included ① application for project implementation, ② assessment, notification, and disclosure to the public, ③ formal objection, and ④ approval of project implementation and notice. These procedures were enacted in December 1994 and they have changed significantly because of the 「Rearrangement of Agricultural and Fishing Villages Act」, which has been in effect since 1995. The changes included that research on the resources of the land should be done and the establishment of a plan should be completed prior to the

application for project implementation. To conduct the Farmland Consolidation Project, research on the resources of the whole area where the project is to be carried out should be done. Based on the research, the integrated plans for farming and fishing village development and the plan for agricultural production infrastructure development should be established. According to the plans, planned site investigations were carried out. Then, the basic plan is to be established through the basic investigation of the feasibility of the agricultural infrastructure development project. Finally, the detailed designs and implementation plans for the sites are to be made. Also, the project operator is assigned after the application for the project.

The Farmland Consolidation Project is conducted by the government, local government, the unions, and public corporations. The project is rarely conducted by landowners, individuals, or groups of people. In either case, the consent and participation of the project participants, such as landowners within the project sites, should be required. The regulations related to the Farmland Consolidation Project stipulate that the project should be consented to by more than 2/3 of project participants. Moreover, the 「Rearrangement of Agricultural and Fishing Villages Act」 highlights that the plans for agricultural infrastructure development and the plans for project implementation should be based on the regional level of integrated development plans. At the same time, the act emphasizes that the development project should be well-planned in accordance with the plans mentioned above. Unless financial assistance, such as government subsidy, is applied for properly when relying on the Farmland Consolidation Project, the implementation of the project will be difficult because the burden of the project participants will increase and the project expenses cannot be procured smoothly.

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