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2013 Modularization of Korea's Development Experience:

Forest Resource Development in Korea

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Preface

The study of Korea's economic and social transformation offers a unique window of opportunity to better understand the factors that drive development. Within one generation, Korea had transformed itself from a poor agrarian society to a modern industrial nation, a feat never seen before. What makes Korea's experience 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, 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 2007 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 in hopes that Korea's past can offer lessons for developing countries in search of sustainable and broad-based development. In furtherance of the plan to modularize 100 cases by 2012, this year's effort builds on the 20 case studies completed in 2010, 40 cases in 2011, and 41 cases in 2012. Building on the past three year's endeavor that saw publication of 101 reports, here we present 18 new studies that explore various development-oriented themes such as industrialization, energy, human capital development, government administration, Information and Communication Technology (ICT), agricultural development, and land development and environment.

In presenting these new studies, I would like to express my gratitude to all those involved in this great undertaking. It was 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 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 and keen insights and expertise in preparation of the case studies.

Indeed, the successful completion of the case studies was made possible by the dedicated efforts 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 Professors Kye Woo Lee, Jinsoo Lee, Taejong Kim and Changyong Choi for their 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.

April 2014

Joon-Kyung Kim

President

KDI School of Public Policy and Management

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Summary

During the colonial period in the early 20th Century, around three years of the Korean War that broke out in 1950 after the establishment of the Republic of Korea in 1948 and the postwar period of political and social turmoil, the forests on the Korean Peninsula faced severe devastation. As a result, the forest devastation rate exceeded 80 percent, and the growing stock was less than 10m³/ha in the early 1960s. Even when forest rehabilitation began in 1978, growing stock reached only 17m³/ha (in 2010, 125.6m³/ha). The soil productivity of forests that occupied 65% of the country remained extremely low, and forest resource development and the production base had been almost destroyed.

Therefore, forest resources were limited to collectable forest products such as fuel-wood, and the economic benefits to residents in rural and mountain villages were quite insignificant. At that time, it was urgent to restore forests to prevent forest disasters. Otherwise, forest deterioration would result in more harm than the good generated by the economic benefits to forest owners and residents in mountain villages. The government promoted both forest rehabilitation and income-boosting projects to reduce poverty in rural and mountain villages through forest resource development.

1. Background and Premise for Study

This study aims to analyze the outcomes of the forest resource development policies implemented by the Korean government. The government has been currently promoting the Fifth National Forest 10-Year Plan, focusing on recreation, culture and welfare through forestry in the global environmental era. After the end of the Second World War and the establishment of the Korean government in 1948, the government implemented the First and Second National Forest 10-Year Plans for forest rehabilitation. Afterward, the government carried out the Third Forest Resource Development Plan.

This study also aims to analyze the experience, technology and institutions involved in the development of production technology and distribution systems since the establishment of the Republic of Korea. These have expanded supply facilities, improved marketing systems and introduced the geographical indication and place-of-origin indication systems based on institutional and technical support from the government for the diversification of forest income sources through forest resource development. In addition, this paper analyzes the various efforts of the Korean government for forest resource development in the global environmental era of the late 20th Century, which emerged together with the Rio conference in 1992.

South Korea, which was one of the poorest countries in the world at the time of nation building in 1948, carried out seven consecutive 5-Year economic development plans between 1962 and 1996. This study researches the primary sources and secondary literature on past projects for short-term forest rehabilitation and forest resource development during the five National Forest 10-Year Plans from 1973 until recently when forest rehabilitation and forest resource development were promoted in connection with the economic development plans. In particular, this paper focuses on the past project activities performed by the agencies related to the forestry field such as the Korea Forest Service, Forest Cooperatives and National Forestry Cooperative Federation, which played a leading role in past and recent forest resource development. Statistical data and literature about income-generating business using forest resources were researched and organized. Furthermore, interviews with practitioners who operated businesses that utilized main forest resource items were used to identify the development process of income-generating businesses using forest resources during specific time periods. Through this study, the experience, technology and knowledge of Korea, which succeeded in becoming a G20 member country and restoring devastated forests, can be shared with the rest of the world.

2. Strategies and System by Phase

After the establishment of the Korean government and before the First National 10-Year Forest Plan (1948~1972), the legal and administrative system for forest resource development had been established by enacting the Forest Law. The government set the foundation for a legal system related to forest resources and spun off the forest administrative organization to the Korea Forest Service. In addition, to make site implementation of forest resource development possible, the government arranged Forest Cooperatives, organizations composed of local residents in rural and mountain villages and forest owners. Based on this effort, the foundation for developing fuel-wood, establishing a stable fuel-wood supply system in rural and mountain villages, producing short-term income-generating forest products and laying the ground for earning incomes was established. In the 1960s, the

proportion of forest resources such as fuel-wood and materials for agriculture accounted for more than 80 percent of the total forest resources. In addition, processed forest products utilizing overseas forest resources such as plywood, which started around the year 1960, and forest mushrooms began to be exported. By improving the foundation for forest resource utilization, it was possible to stabilize the lives of people, boost the incomes of local residents and develop the national economy.

During the First National Forest 10-Year Plan (1973~1978), with the President's strong interest, the Korea Forest Service was transferred from the Ministry of Agriculture and Forestry to the Ministry of Home Affairs, meaning that forest resources began to be managed under strong national protection. In order to protect the forest, fuel-wood resources were allowed to be collected only in designated areas, and fuel forests were intensively established, requiring loans from international organizations for this. This was the only case in which Korea received a loan for the forestry sector. In addition, with the clear goal of quickly completing forest rehabilitation by planting fast-growing trees, the country's soil was environmentally stabilized. Under the state-led export drive policy, in order to boost the income of forest owners, improve product quality and stabilize exports, the forest product marketing system was reinforced. In line with this, efforts were made to reinforce the collection of forest products easily collectable in rural and mountain villages. Furthermore, the collection and export of forest products were intensified by the notification of restrictions on forest product use and sales through forest cooperatives. This policy was also intended to stabilize the sale of domestic forest products in the overseas market. In addition, the plywood industry reached its peak during this period, which had been activated by introducing overseas forest resources to protect domestic forest resources and to boost the domestic economy. Based on fast-growing tree planting and forest conservation efforts together with national policy participation, domestic forest resources were protected, and national economic development was fostered.

The Second National Forest 10-Year Plan (1979~1987) was the phase for establishing forest resources focusing on commercial forests; and natural forests in which forest resources were stably developed. With national awareness and participation, the Second Plan for forest rehabilitation was successfully completed, and the long-term base for forest resource development was set. With the completion of the second plan, the Korea Forest Service was again transferred to the Ministry of Agriculture, Forestry and Fishery, and the Forestry Cooperatives Act was officially enacted. In the 1980s, with the trend of trade liberalization worldwide, the collection, distribution and export of forest products were also liberalized, which had thus far been done using the organization of Forest Cooperatives. As the use of overseas forest products became relatively limited, the plywood industry using overseas forest resources significantly decreased.

During the Third National Forest 10-Year Plan (1988~1997), forest resource management and its use began to shift in line with the increasing awareness of the changing international environment. The Sustainable Forest Management (SFM) initiative was based on the concept of sustainable development adopted at the Rio Conference in 1992. The Convention on Biological Diversity (CBD), UN Framework Convention on Climate Change (UNFCCC), UN Convention to Combat Desertification (UNCCD) took place; and an opening of the domestic forest product market as a result of the UR Round Negotiation in 1993 was realized. In addition, as national income approached 10,000 dollars per capita, forest resources began to be recognized as a recreational source, and forest resource development patterns also began to change from solely increasing income for forest owners through tangible forest product sales to the provision of intangible value such as forest recreation to people throughout the country. This period marked the beginning of scientific and detailed evaluations of indirect forest resource value, which had been evaluated by firsthand experience.

During the Fourth National Forest 10-Year Plan (1998~2007), especially from the 2000s, the profitability of wood production continuously declined, which had served as the center of forest resources. As a result, wood production was not enough to guarantee income for forest owners. As the influence of local governments increased through the introduction of the local autonomy system, the government allowed forest use for multiple purposes. This so-called integrated forest management initiative had previously been restricted to prevent forest devastation. For this, relevant legislation was enacted in 2001, and various support including financial support from the government was provided. Such policy changes greatly contributed to the income increase for forest owners and activation of local areas. In addition, in 2005, the development of recreational forests was facilitated by enacting the Forest Recreation Act, which helped to increase the satisfaction of the public and forest owners through a different approach to forest resource development. This was the period when national demand for forest resource development and use skyrocketed, and the government met this demand by preparing and implementing new and various forest resource development policies.

The Fifth National Forest 10-Year Plan (2008~2017) is currently in progress. In the 21st Century, the tangible production value of forestry is continuously decreasing, and direct benefits to forest owners are also declining. However, as growing stock in forests continues to increase and conditions improve, the various intangible value of forests is steadily increasing, reaching around 20 times each year than that of tangible forest resource development such as wood. While the value of tangible forest resource development is solely beneficial to forest owners, intangible forest resource development value is evenly distributed to all citizens, which becomes the foundation of the welfare of the country,

as intended by the government. Intangible forest value includes various contents such as watershed conservation, water purification, prevention of forest soil erosion and landslides, forest recreation, protection of forest animals, absorption of carbon dioxide, air purification, forest landscape, conservation of biodiversity in forests and forest therapy. Legislation, policies, and institutions are continuously prepared and established to improve these functions, and various financial support is being provided. In addition, the government is promoting the legislation of a direct payment system for the forest environment as a way to return some of the intangible value of the forest to forest owners. The system has already been partly implemented.

3. Main Forest Product Development System by Product Item

This study aims to contribute to the establishment and development of forest resources and income boosting in developing countries by describing the development process of main forest resource creation, production, processing, marketing and export with regard to main forest product items, which have greatly contributed to economic growth for forest owners and people over the past 50 years.

First, timber resource development is based on enough growing stock and forest resources in the provided forest areas. At the beginning of the government's forest initiatives, logging and producing forest resources in poor forest conditions including forest size and low growing stock implied various and endless risks. Following the government's efforts, a strong under-cutting policy was implemented for forest conservation and resource development; and planned forestation projects were implemented for the development of timber resources.

Various policies and projects were implemented, including erosion control, nursery and forestation, silviculture until forests could be used as materials, the establishment of forest roads for efficient utilization of forest resources, mechanization of forestry work and securing a stable labor force. Furthermore, projects according to special policies in the social, economic and cultural aspects had to be considered.

The projects implemented when forestation and forest resource development policies were being intensively promoted included the project cases of shifting cultivation control, cooperative management of private forest, running forest working groups, industrial forest businesses and afforestation. These efforts were analyzed, and strategies for timber resource development and cases in Korea for the prevention of forest devastation and rehabilitation were explained.

Second, there are a variety of mushroom species by region in the world, and many mushrooms that can be collected or cultivated. In the case of Korea, the oak mushroom has generated large amounts of income for forest owners.

The oak mushroom had been widely incorporated into various East Asian cuisine including China, Korea and Japan due to its excellent taste; and artificial cultivation using the hardwood of an oak tree was thus introduced in the early days. Artificial propagation tests took place in 1922 for the first time in Korea.

After the establishment of the government, facilities for a starter culture were built in the National Forestry Cooperative Federation Forest Mushroom Research Center by way of a government subsidy. The First 5-Year oak mushroom propagation plan was established in 1957 to produce and graft spawns. In addition, a forestry experiment station, which is the national forest research institute, greatly contributed to the establishment of cultivation technology by integrating research results and presenting a study on oak mushroom starter culture and cultivation in 1967. As the oak mushroom cultivation business continuously grew, the government prepared the Second 5-Year Plan for oak mushroom propagation (1962~1967). Afterwards, the oak mushroom cultivation business was actively promoted and fostered as an industry that could contribute to increasing the income of farm households and economic development.

For 30 years, oak mushroom cultivation and management have been developed and transformed from sideline work in rural and mountain villages to a specialized and industrialized market. New varieties were developed by the National Forestry Cooperative Federation, and production, supply of starters and cultivation technique guidance were supported by government policy. Meanwhile, from the mid-1980s, test research using acorns or quaking ash for sawdust cultivation took place, but the process was not able to be put to practical use due to bacteria spoilage and low generation rate. However, the process has been adapted, applied and distributed since 1991 and now contributes to the protection of oak species wood. In order to establish specialized cultivation technology and improve productivity, research and development (R&D) for the oak industry has to be emphasized. Although technology that is suitable for various circumstances should first be prioritized, oak mushroom is one of the major forest resource development items that can contribute to increasing the income for local residents in rural and mountain villages.

Third, collecting forest resources has been carried out in a primitive way until recently, and this is not an exception in Korea. Before the 1970s, some part of collectable forest resources such as arrowroot fiber, oak bark, and oak leaf were produced and collected by Forest Cooperatives and supplied to meet the demand of exporters. However, these forest resources were leaked to the market for domestic consumers and brokers, which made it difficult to secure a supply for export.

In 1970, the Minister of the Korea Forest Service could prohibit or restrict the production or use of forest fuel-wood, wood and other forest products when it was considered necessary for forest administration. This power was granted through a presidential decree, Forest Law Article 16 (Restriction on the Use of Forest Products and Industrial Forest). Restrictions on the use of collectable forest products for export have been annually announced; and in addition to arrowroot fiber and pine mushroom, oak leaf was added in 1971, grass seed in 1973, and oak mushroom and China root leaves in 1974, for a total of thirteen species.

In the case of pine mushroom production, Forest Cooperatives took charge of various tasks, including the production guide and promotion, figuring out the amount of production, protecting the rights and interests of Forest Cooperatives members, preventing leaks and black-market purchasing within the area of responsibility to effectively implement relevant projects. With the aim of increasing income for local residents in rural and mountain villages and earning foreign currency by producing and exporting easily found oak leaf and China root (*Smilax china*) leaves, it was strongly encouraged to reach the target amount. Until the late 1980s, collectable forest resources such as pine mushroom, oak leaf and China root leaves were competitive export items and guaranteed a large amount of income for forestry households.

Continuous and various support from the government and voluntary support from people are required for collectable domestic forest products. If continuous education and training intended to raise awareness and interest are provided to the government and forest cooperatives collectable forest products will be praised as income-generating items with small scale capital, using labor force in rural and mountain villages.

Fourth, as the chestnut tree was one of the 10 major species to be planted, it set a goal of planting 120 million trees in the area of 300 thousand hectares during the First National Forest 10-Year Plan. Chestnut village forests were one of the major activities, which directly contributed to raising the villagers' income. According to data in 1975, per ha net profit of chestnut was 1.6 times higher than that of rice production. Annual average chestnut income per village reached KRW 1,445,000 per 5 hectares. As of 1975, since a 80kg bag of rice was priced at KRW 25,000, chestnut income was equivalent to 58 bags of rice. At that time, the per capita GNP was KRW 290,000, which was USD 607 (year 2005 base), and the average income of a farmhouse was KRW 873,000. In this regard, chestnut production could be considered as having a significant impact on raising farmhouse income.

The volume and value of mushroom exports among forest by-products was the highest until the 1970s. However, chestnut exports continuously increased from 1% of total forest by-product exports in 1970 to 30% in 1980, which amounted to 18,000 tons and USD 37 million, taking over the mushroom. In 1988, the chestnut emerged as a promising item when the volume and value of chestnuts exported reached 40,000 tons and USD 92 million,

respectively, occupying 17% of the total forest by-product export. This figure was about 110 times that of 1975.

Korean chestnuts are highly dependent on exports to China and Japan. To expand exports, improving the chestnut's traits and qualities is being required by tree breeding, and new markets should be created by diversifying export markets and chestnut product items. Also, chestnut production costs should be reduced through efficient management of orchards with mechanization of the work.

4. Factor Analysis

The factors that enabled Korea to economically succeed in a short-term period and go from being the poorest country to one that successfully restored devastated forests and developed forest resources are summarized as the following.

First, the leadership of the president and strengthening of forest administration system were integral to Korea's success. Although the country was poor after the establishment of the Republic of Korea, the organization of forest administration became independent by the determination of the president, and thus was able to establish and manage forest resources for about 15 years under the Ministry of Home Affairs with the strong protection of the police force. Although it was a temporary measure, this level of empowerment and case in which forestry was administered under the Ministry of Home Affairs with the strong administrative power of local governments and police force were rare in the world. In addition to poplar and chestnut trees enjoying the backing of the President, after the harvest of forest products, funds for local development and scholarships were provided to local students, further reinforcing the importance of forest resources.

Second, the implementation of a forest master plan was connected to the national economic development plan. The Republic of Korea was established based on liberal democracy, and 5-Year economic development plans were established to firmly develop the national economy for a short time period under the capitalistic economy. In the forestry sector, 10-Year plans were established in connection with this economic development plan. Since 1973, five master plans have been established and implemented in accordance with the circumstances of the era. The forest master plan was not limited to the forestry sector, but was also connected to the national master plan. As a result, the plan was able to contribute to raising awareness, gaining support and budget from the people and the government, respectively, and promoting cooperation and collaboration with local governments.

Third, the establishment and use of Forest Cooperatives enabled the participation of forest owners and local residents. The forests on the Korean Peninsula have long belonged to the country, and local residents have protected and used forests together. Since the 20th century,

forests have been rapidly devastated and become more privatized. For forest rehabilitation, the government established forest administrative system. In addition, the government also aligned forest organizations such as forest village associations and Forest Cooperatives to facilitate the implementation at the local level. At the beginning, the main goal of these organizations was to mobilize people for forest conservation and afforestation and to boost the income of local residents. However, after the forest greening was completed, these organizations turned to cooperatives of forest owners and forestry managers and have done important works in various fields including forest resource development, collection, marketing, and financing. The diligence of the people was a source for activating the forest resource development business.

Fourth, Korea began to perform research and development (R&D) in forest resources development. From the early days, R&D was actively used for rehabilitation of devastated forestry in Korea. R&D enabled the development of fast-growing species for quick forestation and ground covering grasses for forest rehabilitation, forest soil investigation to plant the proper trees on the proper sites, systematic forest resources investigations, periodic monitoring, development of new species for forest resource management – especially in fruit trees for high yield and high income products. R&D also enabled selection of disease-enduring and pest-resistant species, development of various systems and standards to improve the availability of forest resources and scientification of forest resources processing technologies. Therefore, forest owners enjoyed higher income earnings, including foreign currency through expanded exports. In particular, R&D helped promote public forestry awareness by uncovering new value in forest resources in the global environment era through scientific investigations of various characteristics of forest resources.

Fifth, Korea implemented policies and legislation that were appropriate to the needs of the time. During the early 10 years following the establishment of the government, forest resources could not be systematically managed, and forest devastation deepened further. Since the implementation of the Forest Law in 1962, various laws related to forestry have been enacted and amended, which have formed the foundation for policy development and implementation. The early Forest Law included the overall contents for forest protection, rehabilitation and forest cooperatives; however, it has been modified to enable a quick response to rapidly-changing circumstances. In particular, after the 1980s, the Forest Law was abolished for the forest recreation, agroforestry, mountain village development in response to local self-government and forestry promotion. In addition to the forest resource development act and forest village promotion act, new legislation related to forest resource development responding to biodiversity and climate change was introduced. These issues have been prominent since the Rio conference in 1992. The new legislation was enacted and implemented to help promote the effectiveness of forest resource management.

Sixth, forest resource development projects, which were suitable for the period and national income, benefited forest owners and nationals, also greatly contributing to the national economy.

- 1950~1970s – guarantee a basic standard of living through the supply of forest resource
- 1950~current – income raising through intensive major forest product management (chestnut, oak mushroom, etc.)
- 1960~1980s – contribute to domestic economic development through plywood export promotion using overseas forest resources
- 1970~1980s – maximize income of local residents through sales and improve exports of all available collected and cultivated forest products
- 1970~1990s – establish the foundation for forest resource development by implementing planned forestation and silviculture on the basis of the people's diligent participation.
- Late 1980s~current – values as environmental goods such as recreational sources or public forest functions were assigned
- mid-1990s~current – activate the production of forest byproducts through the promotion of agroforestry after local decentralization
- 2000~current – develop and use forest resources as a source for forest therapy and cultural welfare to raise the level of satisfaction in utilizing forest resources.

5. Implication

Although forest deterioration throughout the world has slowed in the 21st Century, the spillover effect of forest resources development, that affects income increase of local residents in forest villages and conservation of global environment, is gaining more attention internationally compared to the past. Forest resources should be developed in the most effective way for local residents, nationals and the country according to circumstances of the era and national income. For this, legislation and institutions should be properly founded, and field-oriented policies need to be developed. With effectively aligned forest administrative organizations, resident associations that can induce the active engagement of forest owners and villagers also need to be organized. There have been many cases where a policy was ineffective because the local government system and organizations for field implementation were weak, despite the strong policies and legislations at the central government level. Therefore, it is necessary to prepare a monitoring and feedback system in order to frequently check the field. As the 21st Century requires resource development based at not only the national level but also the international level, discussions and

consensus in the forestry sector, national strategies for forest resource development that meet the requirement of international conventions regarding biodiversity, climate change and combating desertification should be established. Furthermore, forest resources should be developed, reflecting circumstances of the era when gathering the opinions of local residents becomes more important compared to the 20th Century.

In conclusion, it is noteworthy that forest resource development can be successfully achieved when all available domestic forest resources are utilized in a sustainable manner, taking into consideration both the domestic and international circumstances. The effort should enjoy the support of the general public, the nation's top leaders and relevant administrative organizations. Forest resource development policy should have a solid legal basis, accompanied by the activation of private organizations in the field and sufficient financial support.

Chapter 1

Introduction

1. Background
2. Purpose
3. Methods

Introduction

1. Background

The forests in Korea have been severely devastated due to political and social turmoil during the colonial era in the early 20th Century and the Korean War in 1950 after the establishment of the Korean government. As a result, the forest devastation rate was over 80% in the early 1960s, and forest growing stock was less than 10m³/ha. Even in 1978 when forest rehabilitation was actively promoted, forest growing stock was only 17m³/ha (125.6m³/ha in 2010). Soil productivity of the forest, which accounts for about 65 percent of the country, was extremely low, and forest resources and the production and development base were almost destroyed.

Therefore, forest resources were limited to collectable forest products such as forest fuel-woods, and the economic benefits for local residents of rural and mountain villages were small. At that time, forest rehabilitation in preventing forest disasters was urgent as the forest caused more harm than good for the public. The government also promoted projects to increase income through forest resource development in order to eradicate poverty in rural and mountain villages, as well as to rehabilitate forests. *Saemaul Undong*, which started in the 1970s, aimed to change the mindset of people to positive and active thinking with the catchphrase, "make a better living" and through increased income. Consequently, the forestry sector also actively participated in *Saemaul Undong*. With the beginning of the First 10-Year Forest Rehabilitation Plan in 1973, rehabilitation of devastated forest and forestation was deliberately implemented, and development of income-generating forest products was also systemized. As income-generating products, forest mushrooms, oak, fruit trees and chestnuts were intentionally cultivated, distributed and sold; thus generating income from the forest. As part of the development and supply of income-generating forest

products, the government provided various economic, technological and policy support to rationalize the management of short-term, high-income forest products and promote productivity. Through such policy support, forest resource development contributed greatly to better living for people.

In the 1950s, Korea was the poorest country in the world, and forests were severely devastated to desertification. However, the national income reached USD 20,000 after 2010, and various forest product development projects were implemented based on forest rehabilitation. Therefore, it is important to implement a project modularizing the development experience to improve the effectiveness of forest resource development projects in developing countries by organizing Korea's economic development experience systematically and using this as base line data for the KSP and other development cooperation projects.

Currently, the population of people who make a living relying on forests is more than 1 billion, and most of them are living on less than 2 dollars a day. Therefore, Korea can contribute to the achievement of Millennium Development Goals (MDGs) aimed at poverty eradication and preservation of a sustainable environment by organizing and analyzing Korea's forest rehabilitation, related policies, strategies for the short-term, and income-generating forest resources, as well as applying them to the development of strategies for forest rehabilitation in developing countries and short-term income for residents in mountain villages.

2. Purpose

This study aims to analyze the outcomes of various forest resource development projects of the Korean government under the First and Second 10-Year Forest Plan, which focused on forest greening since the establishment of the Korean government in 1948 after the end of World War II; the Third National Forest 10-Year Plan which focused on forest resource developing, and the Fifth National Forest 10-Year Plan which focuses on forest recreation, culture and welfare in the current global environment. At the beginning of the newly established government, growing stock of devastated forests was less than $10m^3$ per ha, and top soil in the forest was lost, causing soil nutrition leaching. In the situation in which the rooting rate of newly planted seedling was low, and growing of existing trees in forests was also slow, the government had to quickly achieve both goals of increasing income sources for local residents in mountain villages and greening the mountains at the same time.

So far, there have been research papers and theses dealing with breed improvement, cultivation techniques, distribution and profit-making strategies through such items as wood and short-term income-generating forest products. However, there has been limited study

on strategies for various forest resource development over the past 50 years and application to developing countries.

3. Methods

Korea has been evaluated as one of four countries that has succeeded in forest rehabilitation after the Second World War. It is the only country among developing countries.[1] In the background, there have been a considerable number of studies on the success of forest rehabilitation in Korea conducted domestically and internationally through literature review and historical evaluation; and there also have been some studies on the development of income sources for residents in rural and mountain villages and stable settlements. However, forest greening through the rehabilitation of devastated forests was focused and, thus, forest resource development tended to be dealt comprehensively in connection with forest rehabilitation.

This study aims to analyze the experience, technology and institutions of Korea that have enabled the system for production technology development and distribution, expanded processing facilities, improved marketing system, guaranteed forest product safety through a geographical indication and place-of-origin system, designated main production places by item and promoted the development of overseas forest resources. This paper also aims to analyze diverse efforts from the government to develop forest resources through a new concept in the global environment in the late 20th Century, emerging with the Rio conference in 1992.

For this study, we researched the primary sources and secondary literature about forest rehabilitation projects planned after the establishment of the Korean government and diverse forest resource development projects during the five forest plans since 1973. In particular, the past project activities performed by the agencies related to the forestry field such as the Korea Forest Service, Forest Cooperatives and National Forestry Cooperative Federation that played a leading role in forest resource development and recent activities in forest resource development were analyzed. In addition, statistical data and literature about income-generating businesses using forest resource were researched and organized. Furthermore, we conducted interviews with practitioners who carried on a business utilizing main forest resource items by period to identify the development process of income-generating businesses using forest resource.

1. The United Nations Food and Agriculture Organization (FAO) mentioned that countries that succeeded in forest rehabilitation after the Second World War are Germany, the U.K., New Zealand and the Republic of Korea, according to the report "Village Forestry Development in the Republic of Korea" in 1982. Korea is also the only developing country in this group. This statistic is a testament to how achieving forest rehabilitation is as difficult as economic development for developing countries.

It is not easy to mention all forest resource items since a variety of forest resources are produced in the forest. Nor is it easy to refer to specific items since the forest resource items produced vary depending on the period and region. Therefore, an overview of forest resource development by period and its characteristics are provided in this study. Then, timber resource, which is the main forest product, and certain representative items among forest by-products such as mushrooms, nuts and fruit, and collectable forest resource items are studied. The varieties that have had large outputs and contributed significantly to increasing incomes are selected, and the development of forest resource items for these varieties is described in detail. Oak mushroom is selected among forest mushrooms, and China root leaves and pine mushrooms are chosen for collectable forest resources. Also, chestnuts are selected among forest nuts and fruit resources. Based on "case study" by items, we customized the content to the following order: introduction background → policy making and its implementation → evaluation → suggestion of a development model.

Chapter 2

Main Policies for Forest Resource Development

Main Policies for Forest Resource Development

The Korean Peninsula, on which the Republic of Korea is located, is at the north latitude between 33°7' and 43°1' and at the longitude between 124°11' and 131°53', geopolitically bordering China and Russia. The length between the North and South is around 1,000 kilometers, and the width between East and West is around 170 kilometers. The altitude above the sea level of the highest mountain is less than 3,000 meters, but about 70 percent of the country consists of steep mountain regions.

Climate is one of the most important factors that affect the growth of living organisms, including forest resources. The average temperature for the year is 2.5~10°C in the Northern area (north latitude 39~43°), 10~12.2°C in the central area (north latitude 37°~39°), 12.5~15°C in the Southern area (north latitude 32~37°). The annual precipitation is 1,000 ~ 1,800mm in the Southern area and 1,100~1,400mm in the central area, and 50~60 percent of the annual rainfall is concentrated in the summer season.

Agricultural life dates back to B.C. 4,000, and the first country was established in B.C. 2333 in the Korean Peninsula. The establishment of various countries followed, filled with lively economic and social activities.

As the deciduous broadleaf forest was frequently cultivated to secure farmland due to the rising population, the deciduous broadleaf forest has decreased, and pine forests became abundant. In particular, since the host rock of forest is mainly composed of granite, it can be easily weathered by wind and rain. Similarly, the soil can be easily lost in the heavy rainfall period of summer.

The forest and forest resources on the Korean Peninsula have historically been widely used in human life. The private ownership of forest was prohibited, and forest resources had been protected by the Forest Entering Prohibition and Harvesting Prohibition Policy, and

pine plantations. However, in the beginning of the 20th Century, a large amount of forest on the Korean Peninsula was considered ownerless and thoughtlessly used. As a result, the forest's surrounding villages were devastated and became bare mountains. In 1945, the colonial period under Japanese control ended with the end of the Second World War. However, the Korean Peninsula was divided into North and South Korea. After the end of the three-year military administration by the United States, the government of the Republic of Korea was established in the southern part of the Korean Peninsula in 1948. The territory of the Republic of Korea in the southern part of the Military Demarcation Line (MDL) was limited to 42 percent of the Korean Peninsula (around 9,693,000ha), and forests accounted for about 65 percent of the country (around 6,400,000ha).

1. Before the First National Forest 10-Year Plan (~1972)

1.1. Before the Establishment of the Korea Forest Service

Right after the establishment of the Korean government in 1948, forest growing stock was only 6-7m^3 per ha. However, there was a shortage of fuel energy such as electricity and oil. In particular, electricity provided from North Korea was suddenly cut off. Thus, a large amount of forest fuel was consumed in small and medium-sized cities as well as in rural villages. In addition, as a result of the Korean War, the use of forest fuel increased, and already-scarce forest resources decreased.

The government proclaimed the "Temporary Measures for Forest Conservation Act" in 1951, but the law was not properly carried out due to social turmoil. In particular, after the end of the colonial period, around 2 million people returned to South Korea from Manchuria and Japan. And after the Korean War, about 1 million North Koreans came to South Korea searching for freedom. The population flow worsened the energy shortage problem and deepened dependency on forest fuels.

The government of Syngman Rhee proclaimed a tree-planting day[2] in 1946 and made efforts to create forest resources by establishing a 3-year Short-term Afforestation Plan in 1952, the 5-year Erosion Control Plan in 1953, 10-year Civil-owned Forest Plan in 1954, 10-year Soil and Water Conservation Plan in 1958 and 5-year Forest Fuel plan in 1959. However, forest recovery itself was beyond the capacity of the country even before forest resource development initiatives officially began. The budget was insufficient, and illegal and destructive logging surged due to the absence of administrative power.

2. In 1946, after the independence of Korea in 1945, the government chose an important day in the history of agriculture and forestry – April 5 – as the day that the entire nation would plant trees.

Forest resource development in the early 1950s focused on the production of timbers for post-war restoration, forest fuel such as firewood and branches for domestic use, green fertilizer, compost, feed, charcoal, nuts and fruit, mushrooms, medicinal herbs, oak leaves, soil and stone, and other items.

Park Chung-hee's government, which took power through a military coup on May 16, 1961, enacted "The Forest Products Control Act" (June, 2. 1961). And the legal system for forest administration was established by enacting the Forest Law on December 27. Through this legislation, though it was a little bit late, policy changes were attempted to intensify the control of illegal forest products, limit domestic timber supplies by adjusting demand and supply; and meet the increasing timber needs by encouraging the import of foreign timber.

The Forest Law established basic principles for forests and set the goals for national economic development, including forest protection, forest resource development, and land conservation. The details of the Forest Law includes the creation of fuel forests and collection of fuels, forest conservation, the organization of forestry associations which all villagers participated in, and the National Forest Cooperatives Federation which manages all forest associations in the cities and districts. Since there had been the associations for forest conservation by villages from the Chosun Dynasty[3], the forestry association was familiar to forest villagers. The National Forest Cooperatives Federation was established on May 29, 1962, and the forestry associations in provinces, cities, districts and villages were aligned (Yoo, 1990).

The organized forest associations successfully helped various forest resource development projects such as large-scale erosion control projects and fuel forest developing projects by mobilizing residents based on "The Forest Law" and "The Erosion Control Act" (enacted on Jan. 15, 1962). Developed fuel forests were actively used for fuel use in rural and mountain villages, which were dependent on forest fuels. The forest fuel supplies in the early nation-building period provided local residents with benefits directly connected to livelihoods (Yoo, 1997).

As a matter of fact, the forestry sector was not included in the first 5-year economic development plan, which started in 1962 right after a military coup in 1961. Therefore, it was difficult to secure a large amount of budget for the forestry sector and push ahead with forestry projects under the economic conditions of that time.

The outline of the first economic development plan (1962~1966) was to establish the foundation of economic development by expanding and improving energy sources such as electricity and coal, basic industries and social overhead capital. In addition, the main

3. Chosun Dynasty ruled the Korean Peninsula from 1392 to 1910. 27 Kings succeeded to the throne, lasting 518 years.

objectives were to increase agricultural income through the expansion of agricultural productivity, improve the international balance of payments through export promotion and develop technologies. The economic growth rate of this period was 7.8 percent, which was above the original target, and the gross national product (GNP) had increased from 83 USD to 123 USD.

The developed items of forest resources, which were traditionally used in the Korean Peninsula, varied in their use such as food, medicine and industrial materials (KFS, 1997).

- ○ Timber: needle leaf tree (pine tree, etc), broadleaf tree(oak tree, etc)
- ○ Fuel sources: firewood, charcoal, fallen leaves, branches, etc.
- ○ Agricultural materials: green fertilizer, compost materials, feed
- ○ Nuts & Fruit: chestnut, walnut, jujube, acorn, ginkgo nut, tung tree, camelia, larch seeds, pine seeds, etc.
- ○ Fungi: edible mushrooms such as oak mushroom, pine mushroom, black tree fungus, oyster mushroom, clavaria, etc.
- ○ Resin: Pine root, Oriental lacquer, etc.
- ○ Bark and fiber: Oriental oak bark , Tilia amurensis bark, Hemp seed bark and Arrowroot fiber,etc.
- ○ Tannin material: gallnut, alder tree, Quercus dentata bark, Quercus acutissima bark, etc.
- ○ Herb medicine: Poria cocos, Gastrodia elata Blume, Schisandra, gallnut, Chinese pepper, Cornus officinalis, Amur cork-tree bark etc, forest product-based medicine

1.1.1. Fuel Materials (firewood and forest fuel, etc.)

Since the early 1950s, anthracite or oil had been used in cities. However, forest fuel was still used in most rural and mountain villages where a large portion of the entire population of Korea (about 20 million) inhabited, and even in small and medium-sized cities where anthracite had not been provided until the economic development period of the 1960s. The production of firewood decreased due to the harvesting prohibition policy, but a large amount of other forest fuel was used, beyond the amount that was officially recorded.

1.1.2. Agricultural Materials (green fertilizer, feed, etc.)

Forests around the farming area helped boost the income for local residents in rural and mountain villages and activated the local economy by providing fertilizers for agriculture and feeds for stockbreeding. In particular, gathering green fertilizer in the forest was

largely important in strengthening the fertility of soil for increasing agricultural products. The production of green fertilizer, compost fuel and feed in the forest increased due to reforestation. It was also the result of active use and development of forest resources to strengthen the soil with an aim to increase food production.

Table 2-1 | Production of Fuel Materials and Farm Materials

(Unit: M/T)

Classification	Fuel Materials			Farm Materials		
	Firewood	Branch	Leaves & Grass	Green Fertilizer	Compost	Feed
1950	464,963	589,159	939,754	622,776	2,019,971	466,785
1955	154,057	560,208	1,543,365	892,687	5,625,302	831,939
1960	77,021	339,142	3,975,864	863,567	5,760,498	3,135,756
1965	32,180	773,137	4,174,793	2,841,589	14,012,495	1,668,143
1970	144,103	-	-	1,430,662	22,907,664	1,844,379

Source: 50-year History of Korea Forestry, Korea Forest Service.

1.1.3. Production of Nuts & Fruit

There are a variety of species of trees whose nuts and fruit are available in the forest; and chestnuts and walnuts are strongly encouraged to be cultivated for food resources. However, as most nuts and fruit are native species, they are vulnerable to diseases and insects, and their commercial value was not high; thus it was necessary to develop and introduce new varieties. The government promptly established a forest research institute and actively promoted research and development (R&D) of insect-resistant and high-yield varieties. The production of forest resources such as chestnuts, walnuts, pine nuts and acorn, which can be sold in the market, continuously increased as a result of the policy to increase fruit tree cultivation.

1.1.4. Mushrooms

Since the 1950s, artificial cultivation of oak mushrooms has been highly encouraged, emerging as the only export item among forest products. In the case of pine mushrooms, artificial cultivation was not possible, but a considerable amount of natural pine mushrooms was collected and exported. In addition, although the crop situation was sensitive to climate change, relatively stable income was secured through route sales using the organization of forestry cooperatives.

Table 2-2 | Production of Nuts & Fruit and Mushrooms

(Unit: M/T)

Classification	Nuts & Fruit					Mushroom		
	Chestnut	Walnut	Pinenut	Acorn	Ginko Nut	Pine Mushroom	Oak Mushroom	Others
1950	1,656	176	100	960	-	19	6	33
1955	1,082	182	45	715	10	18	12	64
1960	1,321	237	84	504	20	47	76	51
1965	1,985	405	167	1,190	50	24	72	21
1970	2,333	183	133	1,217	104	192	187	40
1972	2,905	107	131	1,175	74	170	283	86

Source: 50-year History of Korea Forestry, Korea Forest Service.

1.2. After the Establishment of the Korea Forest Service

After the expansion and development of energy sources and the completion of setting up basic industries during the first 5-year economic development plan, the second 5-year economic development plan (1967~1971) kicked off with the aim of enhancing food self-sufficiency and forestation, developing the industrial structure by building the chemical, steel, and machine industry, achieving USD 700 million in export, expanding employment, increasing the national income, developing science and technology and enhancing productivity and the technology level.

With the start of the second 5-year economic development plan, the government revised the National Government Organization Act in 1967 to systemize reforestation and tried to vitalize forestry by upgrading the forestry department in the Ministry of Agriculture and Forestry to the Korea Forest Service, an independent agency under the Ministry of Agriculture and Forestry. After the Korea Forest Service became independent, it promoted forestation through afforestation and protection; and coped with the demand for timbers by establishing a long-term timber supply plan and developing a variety of export items to promote forest resource development through export.

1.2.1. Forest Resource Development

The new community movement, *Saemaul Undong*, which contributed to reforestation in Korea, started in April 1970, but it was 1971 when tree planting first began with the slogan of "Greening mountains in our village" when 3,453 villages participated in planting trees in 5,884ha. The Ministry of Home Affairs, which took on the initiative of *Saemaul Undong*,

set the policy direction in 1972. Its main goal was to plan fruit trees and create fuel forests in the mountain behind a village. In other words, the main objective of the movement was to increase the income source of residents in rural and mountain villages and secure forest fuels. For fruit trees, chestnuts, pine nuts, and walnuts were selected for their marketability. For fuel forests, Acacia and alder were planted as they grow quickly in arid and barren soil (Lee, 2013).

Table 2-3 | Guideline for Tree Planting at the Early Stage of Saemaul Undong

Project Title	Project Activities	
Period	4-year Plan (1972~1975)	
Guideline	Implement forestation separately from the Korea Forest Service	
Forestation of mountain Behind a Village	Participant	Forest Village Association
	Forestation Unit	Village Unit
	Location	Establish fruit tree complex around the village and fuel forest at the upper side of fruit tree complex
	Species	Fruit Tree (Chestnut, Persimmon, Walnut, White Pine, Ginko) By Region (Gangwon-do(Apricot), Jeollanam-do (Citron), Chungcheongnam-do and buk-do (Jujube) Fuel Forest (Acacia, alder)

Source: Lee, 2013 (from Saemaul Textbook, Ministry of Home Affairs, Training Center for Efficient Farming Producer, 1972).

The proportion of forestry in the gross national product (GNP) gradually decreased from 1967, when the Korea Forest Service became independent, to 1972 right before the Korea Forest Service moved to the Ministry of Home Affairs. Since it was the first priority to increase food production in the agricultural sector at that time, interest in forestry sector and greening mountains was relatively low although the institution was upgraded to the Korea Forest Service. As a result, the role of the forestry sector as an industrial growth engine was relatively low, and the proportion and growth rate decreased as time went by. The contribution level of forestry to GNP continuously decreased from 3.0 percent in 1967 to 1.6% in 1972. This was because forest production became stagnant due to an under-cutting policy, which had been maintained since the establishment of the government, and other industrial sectors that enjoyed faster production cycles continued to grow. However, such a decrease was common in land production, which is the primary industry, and the proportion of agriculture, forestry and fishery in GNP sharply decreased from 37.5% in 1967 to 26.9% in 1972.

Table 2-4 | Gross National Product (GNP) and Production in Forestry

(Unit: billion Won)

Classification	Gross Product			Distribution Ratio (%)			Growth Rate (%)		
	Gross Domestic Product (at market price)	Agriculture Forestry & Fishery	Forestry	Gross Domestic Product	Agriculture Forestry & Fishery	Forestry	Gross Domestic Product	Agriculture Forestry & Fishery	Forestry
1967	4,669.39	1,750.91	140.03	100.0	37.5	2.8	12.7	11.6	19.5
1968	5,195.61	1,744.35	126.43	100.0	34.2	3.0	6.6	-5.9	15.1
1969	5,911.39	1,960.85	136.71	100.0	33.2	2.4	11.3	1.3	-9.7
1970	17,031.0	4,989.6	319.3	100.0	29.3	3.2	13.8	10.5	8.1
1971	18,563.9	5,157.9	305.2	100.0	27.8	1.9	-	-	-
1972	19,546.8	5,263.3	311.7	100.0	26.9	1.6	9.1	3.4	-4.4

Source: Korea Forest Service, 1989.

1.2.2. Development and Production of Forest Resources

At the end of 1967, growing stock was 63.7 million m^3 and average growing stock was only 9.6m^3 per ha. But the production of sawn timber was 0.8 million m^3, which was 1.2% of growing stock, and the proportion of sawn timber including bamboo was 11.76% of forest products. However, in 1972 after five years had passed, the proportion of sawn timber in forest products had decreased to 10.16%. The production and proportion of main products in forest products decreased as the introduction of foreign wood and development of substitutes for wood increased since growing stock was low and there was a small amount of wood that could be cut down. In addition, the prices and production of by-products such as chestnuts, pine mushrooms, oak mushrooms, and other products increased. On the contrary, materials for farming and fuel accounted for 56.4% and 25.5% of total forest production, respectively, and the proportion of both materials was 81.9%. The percentage of farming material increased to 58.2% in 1972.

Table 2-5 | Component Ratio of Production Amount of Main Forest Products

(Unit: %)

Classification	Total	Timber	Bamboo	Fuel	Farm Materials			Nuts & Fruits	Mushroom	Resin	Cortex	Tannin	Fiber	Medicinal Herbs	Others
					Green Fertilizer	Compost	Feed								
1967	100	11.18	0.58	25.47	4.15	45.37	6.89	0.77	0.36	0.35	0.02	0.02	0.24	0.19	4.41
1968	100	11.17	1.00	24.14	4.17	43.11	6.58	1.61	0.41	0.41	0.05	0.02	0.31	0.42	7.1
1969	100	10.97	0.74	27.07	2.74	44.11	5.96	1.84	0.46	0.46	0.04	0.01	0.24	0.30	5.41
1970	100	7.95	0.58	23.54	3.20	46.12	7.81	2.01	0.85	0.85	0.02	0.01	0.49	0.37	6.89
1971	100	8.56	0.50	21.42	3.84	47.90	7.80	2.48	0.99	0.99	0.03	0.01	0.35	0.28	5.67
1972	100	9.82	0.34	19.15	2.94	47.00	8.31	2.49	1.47	1.47	0.02	0.01	0.43	0.45	7.48

Source: Korea Forest Service, 1989.

Table 2-6 | Production of Main Products (1967~1972)

Classification	Timber (m^3)	Bamboo (sok)	Firewood (M/T)
1967	791,045	229,555	64,499
1968	815,987	285,691	117,712
1969	1,094,559	242,446	112,647
1970	832,762	165,925	144,103
1971	873,948	181,317	105,172
1972	790,210	139,598	106,009

Source: Korea Forest Service, 1973.

The production of by-products such as nuts and fruit and mushrooms among forest resources has very significant effect on increasing income in forestry since it helps to overcome the economic vulnerability caused by long-term investments in the forest and makes intensive use of forestland possible. With such a purpose, the government continuously implemented various projects to increase production of forest byproducts. Since 1968, the Ministry of Agriculture and Forestry led special projects for farming and fishing villages to increase income in the area. In the forestry sector, chestnut tree planting was made the first priority. In addition, in the 1970s, new product items such as the Diamyo oak leaf and China root leaf were developed and produced; and this contributed to forest product export. The below chart details the production of forest byproducts from 1967 to 1972 (KFS, 1997).

Table 2-7 | Annual Production of Forest By-products

(Unit: in Table)

Classification	Chestnut (M/T)	Walnut (M/T)	Pine Nut (M/T)	Jujube (M/T)	Oak Mush room (M/T)	Pine Mush room (M/T)	Cortex (M/T)	Pine Root (M/T)	Diamyo Oak Leaves (C/T)	China Root Leaves (C/N)	Arrow Root Fiber (M/T)
1967	1,201	175	102	-	66	59	1,359	1,602	-	-	148
1968	1,793	168	171	-	138	118	1,064	1,234	-	-	183
1969	1,734	158	115	53	162	119	1,000	612	15,411	-	236
1970	2,333	183	133	45	187	192	869	461	13,304	-	381
1971	2,789	150	214	33	209	64	600	587	7,898	-	274
1972	2,905	107	131	67	283	170	772	459	22,652	2,702	204

Source: Korea Forest Service, 1989.

Plywood made by processing hardwood began to be produced to meet increasing demand during the nation's restoration period after the Korean War. However, since domestic production of hardwood for the production of plywood was not possible, overseas forest resources were imported and processed.

About 2.6 million S/F was produced in 1956 and began to be exported to the United States in 1959. During the period of the first 5-year economic development plan, the plywood industry became the export-leading industry. About 1,138 million S/F, or 450 times the multiplied amount, was produced in 1966, and 3,703 million S/F, more than 1,400 times the amount, was produced in 1972. South Korea emerged as the No.1 plywood export country in the world in the 1970s, exporting about 80 percent of domestic plywood production and accounting for about 20 percent of the world's plywood market through exports (KFS, 1997).

The plywood industry effectively helped develop overseas forest resources and contributed directly and indirectly to national economic development as well as the expansion of employment. The plywood industry not only jumped from the industry for the domestic market to the export industry, but also contributed to the development of related industries such as construction and civil engineering, and improved the structure of the furniture industry.

Table 2-8 | Annual Plywood Exports (1962~1972)

Classification	Log Import (1,000m³)	Plywood Production (A) (million S/F)	Plywood Export (B) (million S/F)	Plywood Export ($)	Ratio of B/A (%)
1962	590	284	-	2,973	-
1963	424	336	-	6,783	-
1964	564	501	-	12,551	-
1965	755	729	-	19,054	-
1966	1,098	1,138	-	30,683	-
1967	1,529	1,490	1,132	41,450	76.0
1968	2,010	2,384	1,762	67,832	73.9
1969	2,650	2,784	1,937	81,587	69.6
1970	3,155	2,872	2,840	101,628	98.9
1971	3,756	3,471	2,810	132,793	81.0
1972	4,167	3,703	3,268	176,279	88.3

Source: Korea Forest Service, 1989.

1.3. Characteristics of Forest Resource Development

For the development of forest resources during this period, a legal and administrative system was established by enacting the Forest Law to improve the legal system related to forests and forest resources; and upgrading the forest administrative agency to the Korea Forest Service to systemize the administrative organization. In addition, the government reformed the forest cooperatives of local residents in farming and mountain villages in order to make site implementation possible. With this foundation, it was possible to create fuel forests, enable a stable supply for forest fuel, produce short-term income forest products and generate income. In the 1960s, the amount of forest resources production such as forest fuel and materials for agriculture accounted for the absolute proportion, which exceeded 80 percent of the total amount of production. In addition, export of processed forest products such as processed plywood using foreign forest resources was significant. Through this improvement, it was possible to increase the income of local residents using forest resources and contribute to national economic development.

2. The First National Forest 10-Year Plan (1973~1978)

The Park Chung-hee's government gained confidence from the success of the first and second 5-year economic development plans and focused on rapid growth, building up the heavy and chemical industries during the third 5-year economic development plan (1972~1976). Although there were hard times due to turmoil in the world economy with the "Nixon shock" in August 1971, right before the beginning of the oil shock in October 1973, South Korea overcame difficulties through the induction of foreign capital, an export drive policy, and construction business in the Middle East. The country maintained its average annual growth rate of 11%.

In this economic situation, the government moved the Korea Forest Service, which had been under the Ministry of Agriculture and Forestry, to the Ministry of Home Affairs in February 1973. In the beginning of the Korea Forest Service in 1967, the forest administration was considered a part of the administration of agriculture and forestry; however, the Ministry of Agriculture and Forestry was busy making rice supply self-sufficient by increasing food production and was not capable of implementing forest resource management and reforestation projects – especially since there were still a lot of bare mountains despite some progress in reforestation achieved by enacting the Forest Law and the Erosion Control Act.

2.1. Forest Resource Development

The First National Forest 10-Year Plan for forestation, which was decided by the Cabinet council in March 1973, can be summarized as quick forestation, national forestation and economic forestation. For quick forestation, rapid growing trees such as poplar and paulownia were planted for the reforestation of bare mountains in a short period. In addition, through national forestation, which all citizens participate in, and economic forestation, which can generate income for local residents in farming and mountain villages, people were induced to voluntarily participate in part of the plan. For forestation, species of trees were standardized to 10 species, including fruit trees such as chestnut trees.

The year 1973 was the turning point in forestry and forest resource development in Korea, and "forestation of rapid growth trees throughout the country" was the basic goal for the next 10 years to 1982. Among 2,637,000ha land area required to be forested, the forestation plan for 1 million ha was established. The ratio of rapid growth trees to long-term growth trees was planned at 7 to 3.

The reason why the outcomes of forestation for the next 10 years after the legislation of the Forest Law did not receive praise was that ex-post management was unsatisfactory. Therefore, the government designated "Silviculture Day" to promote national participation

in tending trees in the autumn to maximize the outcomes of forestation based on public sympathy for forestation.[4]

The responsibility system for inspecting trees was also enforced to examine forestation and ex-post management in the project site, evaluate the outcomes, find improvements and apply the improvements to forest resource development such as forestation and silviculture.[5]

The target of planting long-term growth trees was exceeded, but only 50% of the planned amount of fruit trees, which could contribute to developing short-term income resources, was achieved. Fuel forest for fuel supply was developed as planned. The target was achieved 4 years earlier than the original plan with the following outcome:

- ○ Forestation Plan: 1,000,000ha → 1,080,000ha (108%)
- ○ Reduction of non-stocked forest land: 377,000ha → 217,000ha (85%)
- ○ Reduction of Devastated Land: 120,000ha → 78,000ha (65%)
- ○ Increase of growing stock per ha: 9m³ → 17m³

Table 2-9 | The First National Forest 10-Year Plan and Outcomes

(Unit: 1,000ha, million trees)

Classification	Total	Long-term Growth Tree	Fast Growing Tree	Fruit Tree	Fuelwood Tree
Main Tree		Korean white Pine	Italian Popular Populus alba x glandulosa	Chestnut,	Acacia, Alder, etc.
Sub Tree		Larch Cedar Hinoki, etc.	Paulownia, Alder, Acasia, etc.	Persimmon, Ginko, Walnut, Citron, etc.	
Plan					
- Area (A)	1,000	195	300	300	205
- No. of Tree	2,132	585	607	120	820
Results					
- Area (B)	1,080	358	360	154	208
- No. of Tree	2,960	1,106	756	61	1,037
B/A (%)	108	184	120	51	101

Source: Korea Forest Service.

4. The program was implemented in 1977, and the first Saturday of November was designated for this day. All workers, students, and residents participated in fertilizing trees planted in the spring, pruning, scrub removing and pest control.
5. Under this system, in the cards placed in forestation areas, the results of afforestation, fertilization, silviculture, pests, growing condition, and tree inspection were recorded. The head of the organization was in charge of checking the results.

2.2. Efficient Use of Forest Resources

2.2.1. Establishment of Fuel-wood Forests

The government completed the fuel-wood forest development project in 1977, which began in 1959. During the First National Forest 10-Year Plan for forestation, 207,773ha of fuel-wood forest was created. In order to complete the fuel-wood forest development project, the government acquired a loan worth USD 4,163,000 for the *Saemaul* project from the IBRD (International Bank for Reconstruction and Development) and used it for 127,000ha fuel-wood forest development, which was the target of the project from 1976 to 1977. This action was recorded as the only loan project among forest resource development projects in Korea. It can be estimated that the fuel-wood forest development project was urgent and significantly important (KFS, 1997).

The forest fuel-wood development project is considered a policy that achieved significant outcomes in that 1) it realized early reforestation of bare mountains, 2) protected and developed forest resources by establishing the foundation of normal supply for forest fuel in rural areas, 3) developed timber production forests through the efficient management of fuel-wood forests, and 4) created the property of forest associations in "dong" and "ri." Issues in the project included the following: 1) insufficient forest development due to the regulated usage conversion of fuel-wood forest, 2) difficulties in securing land for fuel-wood forest development, 3) conflict between forest owners and local residents when developing fuel-wood forest, and 4) unsatisfactory ex-post management due to unclear land ownership and a lack of a sense of responsibility. However, such trees as false Acasia, which were established as fuel-wood forests, maintained the long-range value as honey trees as well as fuel-wood resource.

The government focused on forest resource enhancement through forestation and silviculture and made efforts for efficient use of forest resources. In particular, the importance of forest resources was more emphasized due to the first oil shock[6] in 1973. In the early 70s, the total number of fireplaces using fuel-wood was 6,788, and the average number of fireplaces per household was 2.6. In June 1974, the Korea Forest Service endeavored to establish fuel-wood forests and distributed improved fireplaces nationwide to save on the use of fuel-wood. The number of improved fireplaces was 4,675,000 in 1974, 1,293,000 in 1975, and 820,000 in 1976.[7] The amount of fuel-wood consumption per conventional fireplace was 1.7M/T but was improved to 1.2M/T per fireplace, which reduced the use of fuel-wood by 30 percent. Through the enhanced efficiency of fuel-wood use, early forest

6. During the Middle East War from 1973 to 1974, the export price of oil surged four times on January 1, 1974, compared to the price in October 1973.

7. KFS administrative data, 1977.

greening was achieved while at the same time saving on the labor needed to gather fuel-wood.

The improved fireplaces did not require special structures such as casting or concrete as mud and water used for its materials were easy to obtain in farmhouses, and construction was easy enough for anyone to install. In addition, any type of fuel such as branches and straw except for anthracite could be used, and thermal efficiency was high due to its heat control.

2.2.2. Slash-and-Burn Fields Readjustment Project

Slash-and-burn fields sharply increased during the Korean War. During this socially disorderly period, slash-and-burn fields located deep in the mountain areas called for quick readjustments, rehabilitation, fire control and society stabilization. Special Act for Readjustment of the Slash-and-Burn Field enacted in 1966 was not successfully implemented because of a shortage of incentives for slash-and-burn field cultivators. But the 5-year readjustment project started in 1973 was completed successfully during that period.

2.3. Production, Marketing and Exports of Forest Resources

2.3.1. Production of Forest Resources

Timber production was continuously stagnant due to the government's strong under-cutting policy, and firewood for fuel-wood inevitably increased within the minimum range. In the case of byproducts, however, the production of chestnuts, jujubes, oak and pine mushrooms increased by 10, 6.8, 3.2 and 4.8 times, respectively, in 1978 compared to production in 1973.

Table 2-10 | Production of Main Products (1973~1978)

Classification	Timber (m^3)	Firewood (M/T)	Bamboo (sok)
1973	947,597	106,092	247,850
1974	1,027,372	193,390	152,349
1975	930,034	169,566	139,699
1976	1,058,975	165,065	98,708
1977	1,107,733	151,446	118,722
1978	1,064,191	162,675	85,367

Source: Korea Forest Service, 1979.

Table 2-11 | Annual Production of Major Forest By-products

Classification	Chestnut (M/T)	Walnut (M/T)	Pine Nut (M/T)	Jujube (M/T)	Oak Mushroom (M/T)	Pine Mushroom (M/T)	Oak Bark (M/T)	Oak Leaves (C/T)	China Root Leaves (C/N)	Arrowroot Fiber (M/T)
1973	2,949	107	381	105	240	215	782	45,807	7,510	351
1974	3,449	114	375	289	337	137	921	31,510	11,472	312
1975	7,697	166	475	408	456	441	815	38,417	19,519	398
1976	8,811	160	425	260	496	228	616	20,496	20,540	341
1977	18,967	133	418	311	678	327	715	35,924	15,230	658
1978	29,495	223	665	710	776	983	788	73,667	23,000	329
78/73	10.0	2.1	1.7	6.8	3.2	4.6	1.0	1,6	3.0	0.9

Source: Korea Forest Service, 1989.

2.3.2. Marketing System Improvement

The government expanded its list of forest products for limited usage, which had been used since 1970, to increase short-term earnings from forest products and assisted Forest Cooperatives in being responsible producers and suppliers. The National Forestry Cooperatives Federation contributed to an income increase for forest village association members and export expansion by enhancing the development of forest byproducts through provincial subdivisions and Forest Cooperatives and providing exporters with those products. In order to guarantee the rights and interests of forest village association members, the export order was established and the marketing system improved by preventing an accumulation of forest products. Forest organizations produced and secured products at a reasonable purchase price, and The National Forestry Cooperatives Federation started to carry out the trade business in 1974. The number of designated forest products increased to 13 items.

The notification of limited usage and directions for the export drive achieved splendid success in various respects such as an increase of production, strategic supply of products, increase in the supplier's income, improvement in product quality, strengthening of trust between the Forest Cooperatives and its members, and enhancing its organizations, as well as the establishment of a marketing system.

At that time, oak mushroom could generate high income in rural and mountain villages. However, it was required to secure the right place since suitable areas for its cultivation were limited by region; and cultivation technology was also needed. On the other hand,

pine mushroom, Diamyo oak leaves, China root leaves, grass seed and squirrel were easy to collect with simple labor. Thus, these items were extensively produced nationwide to boost income and earn foreign currency.

Table 2-12 | Annual Notification of Forest Products with Restriction of Use

Year	Designated Item	Year	Designated Item
1970	Arrowroot fiber, pine mushroom	1975	Arrowroot wallpaper
1971	Diamyo oak leaves	1977	Paper mulberry bark
1972	Grass seed	1978	Flax bark, Hemp seed bark
1973	China root leaves, Oak mushroom	1980	Larch (empty cone)
1974	Squirrel, Sumac	1981	Cortex (Oak bark)

Source: Korea Forest Policy Society, 1997.

Table 2-13 | Effects on Improving Distribution of Forest Products with Restriction of Use

Classification	Year	No. of Item	Income of Sanrimgae's Member (million Won)	Foreign Income (1,000$)
Before Systemizing Distribution	1962	4	23	312
	1965	4	49	1,475
	1968	5	287	2,803
	1969	5	384	3,531
After Systemizing Distribution (Integration of Forestry Association)	1970	5	662	5,556
	1974	7	2,363	17,299
	1977	9	10,713	53,985
	1980	9	16,713	98,194
	1983	9	31,276	112,758
	1985	9	36,455	99,966
	1986	8	36,273	99,535
	1987	7	43,343	120,466
	1988	7	40,030	165,879

Source: Korea Forest Policy Society, 1997.

2.3.3. Export and Income Increase for Forest Products

In 1962, when the First 5-Year Economic Development Plan started, the total export amount of forest products was USD 3,476,000. The total export amount of forest by-products was USD 503,000, and there were only two items: oak mushrooms and arrowroot wallpaper. However, this amount increased by around 43 times, totaling USD 150.6 million. In 1980, the total export amount of forest products increased up to USD 629.0 million (180 times), and the total export amount of forest by-products recorded UDS 157.3 million (310 times). The proportion of forest products in the country's total export amount continuously declined from 15.8% in 1968 to 0.98%.

a. Plywood

The production of plywood began in response to the need for construction according to the post-war rehabilitation plan after the Korean War. Sungchang enterprise was the first to export plywood in 1959 in the amount of USD 33,000 to the United States. Afterwards, domestic plywood production companies expanded their production facilities in accordance with continuously increasing overseas demand. The export amount went from USD 2.8 million in 1962 to USD 411.9 million in 1978, constituting a 149-time increase in exports over sixteen years (KFS, 1997).

Table 2-14 | Changes in Export of Forest Products

(Unit: million $)

Classification	1962	1968	1971	1976	1977	1978 (plan)
Total Export (A)	55	455	1,068	-	-	-
Forest Product Export (B)	3.4	72	151	441	607	656
Plywood	3	67.4	139	350	409	430
Timber	-	-	1	38	61	80
Timber Product	-	0.3	4	14	38	35
Wallpaper	0.1	2.4	4	19	31	38
Stone	-	-	1	7	38	45
Mushroom & Others	0.3	1.5	2	13	30	28
Ratio of A/B	5.45	15.82	14.14	-	-	-

Source: Korea Forest Service, 1986.

Table 2-15 | Export Unit Price of Main Forest Products

(Unit: $)

Classification	Class & Standard	Unit	Export Unit Price			
			'74	'75	'76	'77
Plywood	4mm×4'×8' General	MSP	67	57	78	74
Raw Chestnut	Premium (40/1kg)	kg	0.84	0.52	1.15	1.20
Canned Chestnut	Premium (harvest rate 65%)	kg	1.83	1.43	1.67	1.91
Walnut	General (130nut/kg)	kg	-	1.20	1.20	1.60
Oak Mushroom	First grade	kg	11	15	19	24
Pine Mushroom	Common grades	kg	16	15	22	34
China Root Leaves	(1 C/S =3,500sheet)	C/S	6.1	6.5	6.5	7.0
Diamyo Oak Leaves	(1 C/S =8,000sheet)	C/S	12.6	13	13	14.5
Grass Seed	Common grades	pyeong	0.70	0.75	0.75	0.75
Squirrel	head (alive)	head	2.4	2.4	2.4	2.4

Source: Korea Forest Service.

From the 1950s to the early 1960s, Korea imported hardwood mainly from the Philippines. In 1965, 65% of total hardwood was imported from Malaysia, and the rest from the Philippines, New Zealand, and the United States. In 1975, 54% of total hardwood imports came from Indonesia, and the rest from the United States. In 1978, the boom period for plywood exports, hardwood import volume from Indonesia was 5,158,000m^3. The plywood export volume in 1978 was 45 time more than that of other main export items such as chestnuts and oak mushrooms.

Table 2-16 | Annual Plywood Exports (1973~1978)

Classification	Log Import (1,000m³)	Plywood Production (million S/F) (A)	Plywood Export		Export/ Production (B/A) (%)
			Volume (million S/F) (B)	Amount (1,000$)	
1973	4,319	5,022	3,824	286,439	76.1
1974	4,926	4,260	2,792	188,888	65.7
1975	5,548	4,857	3,508	228,754	72.2
1976	6,125	5,665	3,556	347,589	62.8
1977	6,687	6,153	4,523	389,003	73.5
1978	7,289	6,880	4,352	411,954	63.3

Source: Korea Forest Service, 1989.

b. Wood and Wooden Goods

The export amount of wood was USD 38,000 in 1964 and continuously increased up to USD 115,308,000 in 1979. The export amount of wooden goods in 1965 was UDS 26,000 and continuously climbed to USD 37,274,000 in 1980. In the 1960s, the government encouraged the establishment of Italian poplar, Populus x albaglandulosa, and other trees so as to secure raw materials for wooden goods. The policy attained satisfactory results.

c. Oak Mushroom

Since 1962, when USD 375,000 of oak mushrooms (138tons) were exported as a form of dried mushroom, the export volume of oak mushrooms had not changed much until 1971. However, the amount of exports constantly rose up to USD 3,323,000 (332 tons) in 1975, and up to USD 9,037,000 (584 tons) in 1978.

Six Asian countries including Taiwan, Hong Kong, Singapore and Malaysia consumed more than 80% of oak mushrooms exported from Korea in 1978. Reflecting the recent trend in which oak mushrooms are used in western cuisine, oak mushrooms are steadily exported to the United States and EC countries such as France, West Germany, Spain, England and the Netherlands.

d. Chestnut

The export of chestnuts amounted to only USD 14,000 in 1966, and a small volume of raw chestnuts worth less than USD 50,000 was exported until 1975. In order to overcome the difficulties of storing, processing technology was developed in the 1970s. As the exporting of canned chestnuts started in 1973 and peeled chestnuts in 1976, the export amount surged, recording USD 3,047,000 in 1977. To see the proportion of chestnut export by item, USD

251,000 of peeled chestnuts was exported in 1976 for the first time, which accounted for 29.9% of total chestnut export. The export amount of canned chestnuts was USD 463,000 (55.2%), raw chestnuts was USD 112,000 (13.4%), and dried chestnuts totaled USD 13,000 (1.9%). Before 1976, raw chestnuts and canned chestnuts constituted the primary export items. Afterwards, peeled chestnuts became the main export. The major partner country for chestnut exports was Japan. In fact, more than 99% of total chestnut exports (mainly peeled chestnuts) were to Japan.

Table 2-17 | Annual Export Outcomes of Dried Oak Mushroom

(Unit: Quantity (M/T) , Amount (1,000$))

Classification	Production Quantity	Export	
		Quantity	Amount
1973	240	261	3,135
1974	337	184	2,022
1975	456	332	3,323
1976	496	400	4,536
1977	678	662	9,135
1978	776	584	9,037

Source: Korea Forest Service, 1989.

Table 2-18 | Chestnut Annual Export Outcomes

(Unit: Quantity (M/T), Amount (1,000$))

Classification	Total		Peeled Chestnut		Canned Chestnut		Raw Chestnut		Dried Shelled Chestnut	
	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount	Quantity	Amount
1973	41	45	-	-	10	18	31	27	-	-
1974	14	15	-	-	4	7	10	8	-	-
1975	47	45	-	-	22	32	25	13	-	-
1976	586	839	203	251	270	463	101	112	12	13
1977	2,001	3,047	1,293	1,775	635	1,209	48	57	25	26
1978	4,691	8,230	4,278	7,402	340	697	13	25	60	106

Source: Korea Forest Service, 1989.

2.4. Characteristics of Forest Resource Development

During this period, the Korea Forest Service was transferred to the Ministry of Home Affairs due to the special interest from the President; and forest resource management began under the strong protection system of the country. In addition, the goal of forest resource development was clearly to complete forest rehabilitation sooner by planting fast-growing trees. In addition, disorganized forest products marketing system was arranged in order to increase the income of forest owners, improve the quality of products and stabilize exports. For this, the notification of restrictions on forest products and forest product collection and exports through the organization of Forest Cooperatives were intensified; and the effort to maintain stable sale of domestic forest products in overseas market was made. In addition, the plywood industry, which was activated through overseas forest resources to protect domestic forest resources and activate the domestic economy, contributed tremendously to the protection of domestic forest resources and development of the national economy.

3. The Second National Forest 10-Year Plan (1979~1987)

The Fourth 5-Year Economic Development Plan (1977~1981), which started right before the implementation of the Second 10-Year Forest Rehabilitation Plan, aimed to establish the structures for self-growth, promote equity through social development, innovate technologies and enhance efficiency. In 1977, Korea achieved USD 10 billion in exports, and the gross national product (GNP) increased to USD 1,000. However, in 1978, the cumulative problems of high prices, real estate speculation, the lack of daily necessities, and difficulties in production began to surface. In 1979, the second oil shock worsened the economic conditions. Therefore, in order to address these problems, "growth," which had been the keyword for economic development plans, was removed in 1979. Instead, stability, efficiency and balance were highlighted in the Fifth 5-Year Economic and Social Development Plan (1982-1986). Price stabilization, liberalization, activation of market competition, development of local provinces and marginalized sectors were emphasized as major policy targets.

The First National Forest 10-Year Plan for forest rehabilitation was completed in 1978, four years earlier than the original plan. However, at the time of establishing the Second 10-Year Forest Rehabilitation Plan, changes in the economic conditions mentioned above also affected the forestry sectors. First, rapid urbanization as a result of economic development plans caused various problems such as a decrease in rural populations and labor force (especially the youth), a decline in the quality of the labor force, and a rise in labor costs. In fact, between 1973 and 1979, prices increased by about 2.9 times. On the other hand, the wage index in rural areas rose about 10.2 times, and the cost of forest

resource management also surged. Second, the demand for timber wood rapidly increased due to continuous economic development and increasing demand for houses, however, the self-sufficiency rate of timber decreased to 15%. Third, national demand for improving the quality of life according to the increase in national income surfaced in the form of demand for conservation of the environment and various functions of the forest.

3.1. Establishment of Forest Resources

In order to meet these national demands, the goal of forestation policy inevitably shifted from a quantity focus of fast-growing trees to a quality focus that took into consideration economic feasibility in the Second Forest Rehabilitation Plan. In order to actively respond to domestic and foreign conditions, strategies were also prepared for the establishment of large-scale commercial forests, the connection between forest and water conservation and the function of environment conservation, the improvement of forestry management such as natural forest development, the expansion of a forestry guide system through the Forest Cooperative, the development of new varieties, and establishing fuel wood forests in preparation of oil crises.

In addition, directed by the president, the policy for turning forests into meadows had been implemented by the Ministry of Agriculture and Forestry since the early 1980s. However, the implementation of this project was difficult because of Korea's climate and soil conditions. As a result, a large size of meadows converted from forests ended in failure and was restored to forest, becoming a failed case in forest resources development.

The Second National Forest 10-Year Plan for forest rehabilitation was completed one year earlier. About 1,075,000 ha of forests was established as a result of a national tree planting and silviculture campaign as well as an effort to develop large-scale commercial forests and natural forests of high quality. In particular, following the establishment of large-scale commercial forests with the aim to develop forest resources, local complexes were also created. As a result, 80 commercial forest complexes of 375,000ha were established by 1986. In addition, an investigation of forest soil in commercial forest complexes was conducted in a scientific approach to forest management after forestation. From 1980 to 1986, precise forest soil maps were prepared through an analysis of commercial forest soil. By planting the right tree at the right location, more efficient forest resource development was realized. In addition, for the development of scientific forest resources, commercial forests were expanded to 21 varieties, selected by area and region in 1985.

With the establishment of fuel-wood forest, the effort to reduce the consumption of forest fuels by reducing the consumption per household was strengthened. In reality, in 1987, when the Second 10-Year Forest Rehabilitation Plan was completed, the number

of households using forest fuels fell by more than 700,000 compared to 10 years ago, and the consumption per household was also reduced from 4.1 M/T to 2.5 M/T. Thus, the total demand for forest fuels decreased to less than half.

Table 2-19 | Use of Forest Fuels

Classification	Total Number of Households in the Country (Unit: 1,000 household)	The Number of Households Using Forest Fuels (1,000 households)			Total Amount of Demand for Forest Fuels (1,000 M/T)	Consumption per Household (M/T)
		Total	Single use	Multiple use		
1977(A)	6,056	2,574	2,054(80%)	520(20%)	10,156	4.1
1980	-	2,420	1,787	633	8,997	3.7
1983	-	2,333	1,658	657	8,492	3.6
1985	-	2,154	1,076	1,078	6,919	3.2
1987	-	1,830	241	1,589	4,655	2.5
1989(B)	-	1,613	160	1,453	3,688	2.3
B/A(%)	-	62.7	7.8	279.4	36.3	56.1

Source: Korea Forest Service.

As the establishment of forest resources and the under-cutting policy for the protection and proliferation of forest resources were implemented, forest growing stock per ha sharply increased from 9.6m³ in 1960 to 30.9m³ in 1987.

Judging that the Second National Forest 10-Year Plan was successfully completed, the Korea Forest Service was again transferred from the Ministry of Home Affairs to the Ministry of Agriculture, Forestry and Fishery. The focus of forestry policy was changed from forest greening to forest resource development, connecting forestry policy with rural and fishing community development projects that started from 1986.

3.2. Production, Marketing and Export of Forest Resources

In the late 1970s, the export and import policy of the government changed to a more open system in accordance with trade liberalization. Thus, trade-related legislation was also reformed. The existing Trade Act was reformed to the Foreign Trade Act and, accordingly, export items of forest products were also liberalized. As a result, from the second-half of 1982, plywood and wood were moved from the list of exporting items to immediate export liberal items. In 1983, oak mushroom was removed from the list of items with restricted use and, in 1984, pine mushrooms, Diamyo oak leaf, China root leaf, and squirrel were

also removed from the list of restriction. Afterwards, wallpaper, canned chestnuts and pine mushrooms were reassigned as immediate export liberal items. After liberalization, forest products enjoyed stable exports with the marketing order established by the restriction of use and sales through the Forest Cooperatives (KFS, 1997).

Due to the recession in the plywood industry from 1982, the total amount of forest products exported declined to USD 460,934 in 1987; but the export of byproducts increased 660 times to USD 332.1 million.

Table 2-20 | Changes in Export of Forest Products

(Unit: million USD)

Classification	1979	1981	1985	1986	1987
Total Export Amount(A)	15,055	21,254	29,566	34,714	47,281
Forest Product Amount(B)	738	631	264	333	461
Plywood	448	392	40	51	56
Timber	115	48	21	27	47
Timber Product	28	34	18	20	26
Wallpaper	41	36	16	12	15
Stone	62	67	84	121	165
Mushroom & Others	44	54	85	102	152
Ratio of A/B (%)	4.90	2.97	0.89	0.96	0.98

Source: Korea Forest Service.

3.2.1. Plywood

In the 1970s, Korea exported plywood to more than 80 countries, among which the United States was the main export market with Europe and the Middle East also high priorities. However, with the second oil shock, as countries exporting hardwood for plywood restricted hardwood exports under the influence of resource nationalism, the competitiveness of plywood export rapidly weakened, and exports slowed significantly in 1979. On February 16, 1982, the Indonesian government made plywood plants state-owned and linked this to a quota policy. In addition, the government banned completely hardwood exports and took measures to produce plywood domestically. As a result, Korea lost its competitiveness in the U.S. market, which accounted for 30 percent of the world's plywood import volume, and the number of export partner countries also declined to 60.

With this decline in exports, plywood companies went bankrupt and closed due to oversupply of production facilities. Production declined until 1986 when exports began to recover.

Table 2-21 | Annual Plywood Exports (1979~1987)

Classification	Export	
	Quantity (million S/F)	Amount (1,000$)
1979	3,518	447,928
1980	2,564	352,199
1981	2,896	391,645
1982	1,740	201,126
1983	936	109,857
1984	567	66,579
1985	343	39,807
1986	459	60,703
1987	473	56,107

Source: Korea Forest Service.

3.2.2. Wood and Wooden Products

In the 1980s, as the countries of origin began to produce and export hardwood themselves, competitiveness weakened, and export amount fell to USD 20,546,000 in 1985. The export amount of wooden products declined to UDS 17,536,000 in 1985 due to difficulties in securing raw materials caused by export restrictions from the hardwood origin countries, as well as the growing presence of China in overseas markets. Exports reached USD 19.8 million in 1986 and USD 25.6 million in 1987.

3.2.3. Oak Mushroom

The export of oak mushrooms rose from USD 8,857,000 in 1979 to USD 21,764,000 in 1987. In the case of pine mushrooms, the export amount steadily increased from USD 16,370,000 in 1979 to USD 40,253,000 in 1987. In 1987, the joint sale of artificially cultivated oak mushrooms was 399 tons, and the income of local residents was only about KRW 6 billion. On the other hand, the joint sale of natural and collected pine mushrooms was 657 tons, and the income of local residents was around KRW 30 billion, about five times the income from oak mushrooms. As the income of local residents cultivating pine mushrooms rose, the domestic sale of pine mushrooms was restricted, and total output was exported to Japan, bringing about pine mushroom cultivation areas that were thoroughly protected by local residents.

3.2.4. Chestnuts

As the export volume of chestnuts surged after 1966 due to the export of peeled chestnuts, reaching USD 83,957,000 in exports in 1987 – accounting for approximately 18% of the total forest product export amount – chestnuts have been considered a promising export item.

In terms of proportion of exports by item, the export amount of peeled chestnuts was USD 75,550,000, and this proportion accounted for 90% of total chestnut exports. The export of canned chestnuts reached USD 7,223,000, and its share of exports was 8.6%, raw chestnut exports totaled USD 1,165,000, which accounted for 1.4%, and dried chestnuts reached USD 19,000 with a export share of 0.02%.

Chestnut items such as peeled chestnuts, canned chestnuts and raw chestnuts had been exported without any restrictions until 1982. However, the large amount of peeled chestnuts exported by dumping to Japan created a disturbance in the export order. In order to reinstate order in the export system by preventing excessive competition and maintaining reasonable export prices, the government requested a recommendation from the Korea exporter's association for canned food (Korea exporter's association for Food, Agriculture, Forestry and Fisheries) regarding the export of peeled chestnuts on July 1, 1982.

Cultivating chestnut trees as an economic fruit tree to boost the income of local residents in the rural and mountain villages was encouraged during the First and Second National Forest 10-Year Plans. Since chestnut trees planted from 1973 to 1987 (under 15 years old) accounted for 76% of total chestnut trees, and domestic consumption was less than 50% of total chestnut production in Korea, chestnut exports needed to be encouraged to protect the farm households that cultivated chestnuts. Therefore, the government provided financial support for chestnut export promotion through the reserve fund for agro-fishery products that had been in existence since 1977, in accordance with the Distribution and Price Stabilization for Agriculture and Fishery Products Act.

3.3. Characteristics of Forest Resource Development

This policy represented the government's focus on developing economic forests and natural forests, thus steadily developing forest resources. Due to the success of the Second plan, forest rehabilitation in Korea was completed. With the end of the plan, the Korea Forest Service was again transferred to the Ministry of Agriculture and Forestry from the Ministry of Home Affairs. The Forestry Cooperatives Act was also enacted. In the 1980s, as collection, distribution, and export using the organization of Forestry Cooperatives was liberalized and the use of overseas forest resources was restricted, the plywood industry using overseas forest resources declined.

4. The Third National Forest 10-Year Plan (1988~1997)

Domestically, the 24th Seoul Olympic Games were held in 1988, which resulted in the national income reaching USD 10,000 in the middle of the 1990s. Internationally, the UN Conference on Environment and Development (UNCED) was held in 1992, resulting in various changes both domestically and internationally.

Korea completed forest rehabilitation during the periods of the First and Second Forest Rehabilitation Plans and promoted forest resource development as a new paradigm in the Third Plan based on forest rehabilitation. The name of the plan also changed to forest resources promotion instead of forest rehabilitation. In particular, right before the establishment of the Plan, the basic goal of the Sixth 5-Year Economic and Social Development Plan (1987~1991) was "economic advancement and promotion of national welfare based on efficiency and equity." Since this plan was prepared as the first step action plan to become an advanced society in the 21st Century the forestry sector also reflected this goal in its own Third Forest Resources Promotion Plan. The Seventh Plan (1992~1996), which was established in the latter half of the Forest Resources Promotion Plan, aimed to induce the engagement of people by enhancing the system and public awareness, increase growth potential, expand the international market base and improve the living standards of nationals.

Various strategies were reflected in the Third Forest Resources Promotion Plan. First, it is necessary to make continuous efforts to improve the quality of forest rehabilitation despite success in increasing the amount of forests. Second, forests play a role of providing a resting place to people in accordance with the changes in living conditions caused by industrialization, urbanization and an increase in income. Third, forest conservation is considered one of the priorities needed to protect the environment in accordance with the international conventions such as the UN Conference on Environment and Development (UNCED).

In order to respond to the changes in domestic and international conditions, the forest resource development policies during the period of the Forest Resources Promotion Plan were established with the aim to 1) select economic tree species, 2) expand forestation by planting trees of special use such as fruit trees in order to increase the income of local residents, 3) maintain 21 varieties of trees and plant appropriate trees on appropriate sites, 4) transform the decision-making process from a top-down to bottom-up approach, which reflects the opinions of the field, and 5) expand and improve facilities for recreation and forest education in forested areas, including natural recreational forests (KFS, 1997).

4.1. Establishment of Forest Resources

Large-scale forestation was completed through the First and Second Forest Rehabilitation Plans, and the focus of forest resource management became silviculture. During the period of the plan, 320,000ha of commercial forest development and 3,030,000ha in silviculture projects were implemented. In addition, in order to prepare the base for efficient forest resources, the system using mountain areas was modified, comprehensive development of mountain villages took place, and forest recreational and cultural facilities were established.

First, forestland was divided into production forestland (3,554,000ha), forestland of public interest (1,503,000ha), and semi-reserve forestland (1,395,000ha) to streamline the use of forest land.

Second, in order to establish the base of management, private forest management and forestland grouping was promoted. A multi-purpose production plan was put in place, and it was promoted to provide intensive government support according to the designation of the forestry promotion areas (1,500,000ha), build forest roads and facilitate mechanization. As forest road facilities expanded, road density was improved from 0.15m to 1.9m.

Third, for the stable supply of forest products and effectiveness of the marketing system, the government encouraged an increase in the production of forestry promotion areas, expansion of overseas forest development, introduction of oversea timber, construction of venues for collecting forest products and conducting direct sales, shipments and joint sales. About 91 forest product marketing centers were built, including one comprehensive forest product marketing center. About 260,000ha of overseas afforested land was secured to facilitate stable, long-term timber supply sources.

Fourth, in order to develop income sources, forest income was diversified and short-term based. In addition, recreation forests and wood bathing facilities were built, and forest byproducts were made into specialties.

4.1.1. Development of Short-term Income Forest Products

Suppliers of short-term income forest products were severely affected by a shortage of the labor force in rural and forest villages and cheap imports of forest products from China. In order to stabilize rural income and realize smooth supply and demand for forest products, the government promoted production by designating main producing districts, providing subsidies for production facilities and shipment adjustments, differentiating products by country of origin, and developing new income-generating crops and varieties.

Table 2-22 | Designated Production Regions for Short-term Income-generating Forest Products

Classification	Number of Complex	Regions
(7 items)	(37 complex)	
Chestnuts	6	Buyeo, Hadong, Sancheong, Gwangyang, Gongju, Sunchang
Walnuts	1	Yeongdong
Pinenuts	1	Gapyeong
Jujubes	5	Yangpyeong, Gyeongsan, Miryang, Yeongwol, Cheongdo
Oak Mushrooms	9	Yeongdong, Gongju, Jinan, Jangheung 1, Wonju, Sangju, Geoje, Jangheung 2, Cheongwon
Pine Mushrooms	9	Yangyang, Uljin, Bonghwa, Yeongdeok, Samcheok, Goseong, Mungyeong, Andong, Inje
Wild Vegetables	6	Pyeongchang, Muju, Hongcheon, Gapyeong, Ulleung, Jinan

Source: Korea Forest Service.

4.1.2. Development and Distribution of Processing Machinery

In order to address the problem of an insufficient labor force in rural and forest villages, mechanization was promoted with the expectation of saving on labor. Such items as chestnut peeling machines, as well as automatic dryers for oak and jujubes were the priorities for development.

4.1.3. Development of New Income-generating Crops

In response to market opening, new income-generating crops were developed and distributed. Higher value-added resources such as food and medicine, resin, oil sources, and sap were distributed. In particular, acer mono sap, potted plants, landscape trees and wildflowers began to be actively distributed.

4.1.4. Amendment of the Forestry Cooperatives Act

In order to activate forest management centering around forest owners, the Forestry Cooperatives Act was legislated in 1993. Instead of forest village associations, which had contributed to forest rehabilitation and protection, the Forestry Cooperatives were organized as unit associations for city and county. According to the Forestry Cooperatives Act, forest owners and managers had to join as members of the Forestry Cooperatives. In addition to aligning the Cooperatives oriented to forest owners, producers' organizations by

item were also encouraged, for example, by enabling expert associations to be organized under the Forest Cooperatives for the development and distribution of short-term income-generating forest products. However, the Forestry Cooperatives Act was again amended to the new Forestry Cooperatives Act in 2000, which contains a wider concept of the Forestry Cooperatives with more inclusive membership.

4.2. Use of Recreational Sources of Forest

During the third forest resource development plan, recreational forests began to be established in 1988 to achieve the forestry policy goal of promoting public interests through forestry, as well as to develop recreation forests as a new forest resource development business. The use of forests as a recreational source was intensified as it became legal to designate forest areas with spectacular landscapes and easy access as recreation forests by the Forest Law, in the case of more than 50ha of national and public forests and more than 30ha of private forests. For a suitability assessment of recreation forests, only those forests that passed the assessment using six items and 32 investigation factors could be designated as natural recreation forests. It was possible to designate a certain area as natural recreation forests only when that area contained recreational sources such as waterfalls or caves, which could characterize natural recreation forests, or when other conditions were met upon consultation with the Ministry of Environment.

Table 2-23 | Evaluation Standards for Appropriate Recreation Forest Sites

Classification	Survey Factors
Scenery	Diversity of land, status of environmental destruction and contamination, views, area, scenery, specialties
Life	Age of upper trees, plant diversity, growth status, evaluation of plant view, wildlife diversity
Drainage	Length of valleys, maximum width of streams, water quality, length of waterside use, average width of waterside use, waterside scenery, flowing streams
Development condition	Feasible area for facilities (below 15°), land ownership, limited factor of land use, frequency of disasters, expected development cost, parking areas
Accessibility	Length of unpaved roads, walking distance, width of access road, distance index to neighboring city
Recreation factors	Historical and cultural legacy, diversity of recreation opportunities, existence of local products, status of use before development

Source: Korea Forest Service.

Since the opening of natural recreation forests in 1988, a total of 110 places of recreation forests, including 67 places of natural recreation forests, 28 forest bath sites, and 15 training camps were built by 1997. The number of people who have used natural recreation forests has reached 2,471,000 as of today. In addition, the appraised value of forest resource development as public goods was announced in 1987. The awareness of forest resource development as recreation forests has increased since the recreational function of forests was added to the list of evaluation items in 1995, in addition to the existing six items of watershed conservation, air purification, protection of soil erosion, water purification, protection of forest landslide, and protection of wild animals.

4.3. Production and Marketing of Forest Products

4.3.1. Production of Forest Resources

The total production amount of forest products reached KRW 979,800 million and accounted for 0.2% in 1995. In terms of the proportion of forest products by item, timber production accounted for only 7%. However, the proportions of nuts and fruit, and mushrooms were relatively high. In the case of Korea, as forest resources were still in young forests, logging had been restricted, and the proliferation of forest resources was highlighted by this prohibition policy. In addition, this policy is also attributable for the forest resource development policies focusing on byproducts.

Table 2-24 | Production Amount of Forest Products

(Unit: billion Won)

Classification	1988		1992		1995		1997	
	Amount	%	Amount	%	Amount	%	Amount	%
Farm materials	369.1	49.9	295.8	35.8	3,147	32.1	341.5	30.7
Nuts & Fruit	16.2	15.7	192.3	23.3	2,957	30.2	344.8	31.0
Mushroom	50.7	6.8	99.6	12.1	914	9.3	94.2	8.5
Timber	56.7	7.7	48.7	5.9	676	6.9	79.3	7.1
Fuel-wood	92.6	12.5	40.9	5.0	230	2.4	17.7	1.6
Other	55.0	7.4	147.9	17.9	1,874	19.4	233.1	21.1
Total	740.3	100.0	825.2	100.0	9,798	100.0	1,110.6	100.0

Source: Korea Forest Service.

4.3.2. Forest Products Marketing

The project for improving the forest products distribution system to protect the rights and interests of producers and consumers began in earnest with the Third Forest resource development Plan. The Forest resource development Plan initially emphasized the need to improve the distribution system by building direct stores, places for wood collection, distribution centers and processing plants. However, in the latter period, distribution centers and direct stores were integrated into direct stores. In addition, a computerization system for forest products distribution was developed, and information services for wood and byproducts have been provided since 1995 in order to establish an information system, which links distribution facilities such as wood collection places, direct stores, forest product processing complexes and consumers (KFS, 1997).

a. Direct Sales Store for Forest Products

Since 1985, one direct store has been built every year. The location of the direct store was determined by an annual forest production of at least KRW 1 billion, and where a supply system could be established through direct transactions between producers and consumers. Stores were mainly built in areas where mass consumption was possible, and at the site of pilot projects of comprehensive development of mountain villages and metropolitan cities, provinces, cities, districts.

b. Collection Places for Wood

Collection places were established where sustained yields were possible, where the forest size exceeded 50,000ha, annual saw timber production exceeded 1,000m^3, or growing stock exceeded 1 million m^3. Such places were built mainly in thinning model complexes, sites for pilot projects of comprehensive development of mountain villages, or in places that could be linked with a forest product comprehensive processing complex.

c. Storage Facilities

Storage facilities were established in accordance with the demand from forest owners for low temperature storage facilities to prevent sharp price falls because of oversupply.

d. Forest Product Processing Complex

Forest product processing complexes have been built since 1995 for the distribution of wooden products in consumption areas on a metropolitan or national scale. It is also aimed at conducting a comprehensive process to identify domestic products, realize joint sales, and the drying, preservative treatment and production of processed products.

4.3.3. Forest Products Import

The export amount of forest products was about USD 505 million in 1995, and a variety of items were exported. By item, the proportion of stone was 35%, chestnut was 23%, pine mushroom was 13%, wooden products was 11%, plywood was 9%, sawn wood was 3%, oak mushroom was 3%, and others were 3%, showing that non-timber goods accounted for most of the exports. By country, the bulk at 77% was exported to Japan, 10% to China and 13% to other countries.

Due to intensified domestic environmental regulations and higher labor costs, stone production has been decreasing every year, and export have also been declining as cheap products from China occupy more of the Japanese market. The export of wooden products, chestnuts and pine mushrooms are also difficult as cheap products flourish in major export partner countries. As the UR negotiations were agreed upon in 1993, the GATT system that started in 1948 eventually evolved into the WTO system. During the negotiation process, the markets for all goods and services including forest products were open through tariffication without exception. The domestic market for chestnuts, pine nuts and jujubes, which had been regulated as import restriction items, were also open without exception, but high tariffs were allowed – mitigating the negative impact on domestic farm households (KFS, 1997).

Table 2-25 | High Rate of Tax on Chestnuts, Pine Nuts and Jujube

Classification	Liberalized Year	Basic Tax Rate ('94)	High Rate of Tax	
			1 year ('95)	10 years after (2004)
Chestnut	1995	50%	241.4% or 1,618Won/kg	219.42% or 1,470Won/kg
Pine Nut	1995	30%	623.5% or 2,930Won/kg	566.82% or 2,664Won/kg
Jujube	1995	50%	672.5% or 6,381Won/kg	611.43% or 5,800Won/kg

Source: Korea Forest Service.

Table 2-26 | Items with Specific Duties and Allowances

Classification	'86 Basic Tax Rate(%)	'95 Basic Tax Rate(%)	Allowance Plan	
			1995	2004
Bracken	30	30	High tax rate between 99% or 2,713Won/kg	High tax rate between 99% or 2,466Won/kg
Oak Mushroom	30	30	High tax rate between 99% or 1,787Won/kg	High tax rate between 99% or 1,625Won/kg
Dried Persimmon	50	50	High tax rate between 99% or 1,117Won/kg	High tax rate between 99% or 1,015Won/kg
Acorn	20	5	High tax rate between 99% or 359Won/kg	High tax rate between 99% or 327Won/kg
Pine Mushroom	30	30	High tax rate between 99% or 8,226Won/kg	High tax rate between 99% or 7,748Won/kg
Gingko	30	30	High tax rate between 99% or 883Won/kg	High tax rate between 99% or 803Won/kg

Source: Korea Forest Service, 1997.

4.4. Characteristics of Forest Resource Development

The management and use of forest resources began to change based on the raised awareness of the changing international environment such as the SFM based on sustainable development adopted at the Rio Conference in 1992, UNCBD, UNFCCC, UNCCD and opening of markets for forest product imports. Furthermore, as the national income reached USD 10,000, forest resources began to be considered as a recreational source, and the focus of forest resource development turned to providing intangible value such as forest recreation by providing monetary values through income boosting.

5. The Fourth National Forest 10-Year Plan (1998~2007)

The local self-governing system was introduced to Korea on June 27, 1995, by holding the four elections (unit assembly, large-unit assembly, chief of local government, and chief of large local government). Local autonomy was necessary to address the gap between cities and provinces, which had widened due to urbanization and continued to increase since the 1990s. Local government autonomy was also required to promote social and economic development befitting local circumstances rather than through a centralized system of government.

In addition, the 5-Year Economic Development Plans, which had been established every five years since the early 1960s, were cut off after the Seventh New Economy Plan ended in 1996. In 1997, in the final year of the economic development plan, the country became nearly bankrupt and, in 1998, the government supported by the IMF discarded the economic development plan on the grounds of guaranteeing freedom of private economic activities, incorporation of the market economic order, and financial stabilization. Instead, the government only took charge of fiscal policies and public goods management, which were necessary, and minimized its intervention in other things.

However, despite these changes in social and economic circumstances, a mid-term plan in the forestry sector was needed, and the government continued to prepare the 10-Year Forest Master Plan.

Table 2-27 | Urbanization Trend

(Unit: %)

Classification	'60	'70	'80	'90	'00	'05	'10
Urbanization Rate	39.1	50.1	68.7	79.6	88.3	90.1	90.9

Source: Ministry of Security and Public Administration.

In the 2000s, urbanization had rapidly progressed due to social and economic development, reaching a rate of 90%. As the gap between urban and rural areas had widened since the 1990s, and cheap products were continuously imported, it became necessary to develop new forest resources and produce new forest crops.

Table 2-28 | Income Changes by Urban/Rural Comparison

Year	Household Income of Urban Worker (1,000Won, A)	Farmhouse Income (1,000Won, B)				Agriculture/ Farmhouse Income (%)	B/A (%)	Remarks
		Total	Agriculture	Besides Agriculture	Others			
1980	2,808	5,706	3,669	1,060	977	64.3	203	After 1990, gap between urban and rural income increase
1990	11,316	11,017	6,264	2,841	1,912	56.9	97	
2000	28,644	23,072	10,897	7,432	4,743	47.2	81	
2002	33,504	24,474	11,274	8,140	5,060	46.1	73	

Source: Statistics Korea.

5.1. Establishment of Forest Resources

Due to systematic artificial forestation and silviculture, forest stock grew up to 63m^3 per ha in 2000. However, due to the rise in labor costs and stagnant timber prices, the rate of return on inward investments in major species such as pine, nut pine, larch and cryptomeria has continuously decreased since the mid-80s.

Table 2-29 | Changes in Internal Rate of Return (IRR) in Major Species

Classification	1985	1990	1997	2000	Harvesting Age (year)
Pine tree	7.6%	4.8%	1.2%	3.1%	50
Korean pine tree	9.5%	6.2%	3.4%	4.7%	60
Larch	5.9%	4.0%	0.3%	-1.5%	40
Cedar	5.8%	3.9%	-2.1%	-2.1%	40
Oak	-	-	0.8%	-1.4%	50

Source: Korea Forest Research Institute.

Due to a decrease in the face value for forest owners as well as a continuous decrease in the receivable ratio, it was difficult to guarantee the income of forest owners and maintain Sustainable Forest Management (SFM). Although the public value of forests such as the function of environment conservation involves dozens of timber production activities, the economic benefits directly paid to forest owners are not considerable. Therefore, the owners of mountains are unwilling to maintain forest management.

Despite the differences by region, the average cutting volume is 80m^3 per ha, average age for final cutting is 50 years, and average benefits to forest owners is only KRW 1,200,000. This means the income of forest owners per ha is only about KRW 1,200,000. Assuming the final cutting is the only income source for forest owners, and given that income from thinning does not count, the average income of KRW 24,000 per ha is generated in forestry every year. Considering the small size of mountains, the annual income of forest owners per capita is only about KRW 528,000 (Yoo & others, 2004).

In order to overcome these difficulties and activate the local economy, the Forest Service, following the introduction of local governments, introduced and initiated Agroforestry in the Fourth National Forest 10-Year Plan in 1998. The Ministry of Agriculture and Forestry directed agriculture in forests. For a while, agroforestry as well as entrance into mountains had not been allowed in consideration of forest devastation in the 1960s and 1970s and the failure to transform forests into meadows in the 1980s.

Agroforestry gained legal impetus by revising a part of the Forestry and Forest Villages Promotion Law and inserting Article 9-2 on Agroforestry Support on December 31, 2001. The law enacted support to agroforestry of short-income businesses together with timber production so that forestry workers could realize a sustainable and stable income. The law also enacted development and distribution of management models by type, suitable forest crops and technologies for cultivation in forest areas.

Although agroforestry has a short legal history, the production of crops such as camphor has decades of history in the field. Since budget support from the Korea Forest Service was initiated in 1998, various financial support from the national treasury and loans have been provided, and forest resource development has been diversified.

Table 2-30 | Annual Outcomes and Support Plan for Agroforestry

Classification		Total	1999	2000	2001	2002	2003
No. of Place		98	5	18	20	25	30
Cost (million Won)	Total	10,282	546	1,560	2,180	2,726	3,270
	Central Government Subsidy	2,056	109	312	436	545	654
	Loan	3,085	164	468	654	818	981
	Local Government Subsidy	2,056	109	312	436	545	654
	Owner Charge	3,085	164	468	654	818	981

Source: Korea Forest Service.

Although the amount of business support is small and the number of beneficiaries is also small, the interest of forest owners in agroforestry is increasing in response to a drop in timber production productivity. Thus, a number of forest owners participate in agroforestry with their own money. Currently, the Korea Forest Service divides agroforestry models by type and provides differentiated assistance. The Service also encourages the production of short crops while maintaining forms of mountains.

Table 2-31 | Types of Agroforestry by the Korea Forest Service

Classification	Short Income	Timber Production	Ecological Management
Concept	Mainly short income	Mixed with timber & short income	Maximization of biological production
Guideline on Site Choice - Forest Areas - Ratio of Timber Production	10ha or more 50% or more	10ha or more 70% or more	5ha or more 90% or more
Guideline on Candidate Selection	Forester for short income with timber management	Forester for short income with timber production	Forester who think ecological forest management
Guideline on Business Selection	Keep the original mountain type and production of short income items	Keep the original mountain type and production of short income items in limited areas	Production of short income items such as cattle, bees, useful insects under trees
Guideline on Support for Production (seeding cost, etc)	100% of basic working expences 50% of production expences	100% of basic working expences 50% of production expences	100% of basic working expences 100% of production expences
Total Budget	Max. KRW 50 million	Max. KRW 70 million	Max. KRW 150 million

Source: Korea Forest Service.

In detail, the amount supported by the Korea Forest Service toward agroforestry is within KRW150 million per place, of which 20% is from the national treasury, 20% from local taxes, 30% from loans and 30% out of pocket. Loan conditions include an annual interest rate of 4.0%, and a 7-year redemption period after a 3-year term of the loan. About KRW 2 billion in national treasury was provided by the end of 2003 in 98 places, which is not a considerable amount. The people who received such subsidies launched the Association of Agroforestry in 2003 in order to develop forestry as a competitive industry by rationalizing management through production technology development, establishing effective distribution systems and promoting information transfer and cooperation.

5.2. Legalization of Forest Resources as Recreational Resources

Beginning with the recreation forest in Mt. Yumyeong which was designated as the first natural recreation forest in 1998, a total of 148 national, public and private recreation forests have been established as of 2012. Since 2012, healing forests have been newly designated, and thus forest resources are being developed at the level of recreation and healing.

Table 2-32 | Designation and Use of Natural Recreation Forests

Classification	Classification	1988	1993	1998	2003	2008	2011
No. of Place	Total	4	31	68	93	115	125
	Central gov.	3	-	24	30	37	38
	Local gov.	1	-	37	46	61	72
	Private	-	-	7	16	17	15
No. of Users (1,000 people)	Total	-	1,170	2,680	4,344	7,627	10,684
	Central gov.	-	-	538	1,003	2,361	3,661
	Local gov.	-	-	1,940	3,052	4,749	6,281
	Private	-	-	201	289	517	742
Income Amount (1 million Won)	Total	-	190	5,346	14,094	26,907	34,767
	Central gov.	-	-	-	4,730	8,927	12,183
	Local gov.	-	-	-	6,599	14,710	18,857
	Private	-	-	-	2,765	3,175	3,727

Source: Korea Forest Service.

While recreation forests are located at a long distance from cities, and some amount of time is spent on reaching these destinations, forest therapy places are provided as places for forest recreational activities by installing basic facilities for forest bathing in suburban forest areas. Forest bathing places began to be established from 1994, mainly in public forests. As of the end of 2011, a total of 163 places were created on 8,403ha.

Table 2-33 | Number and Size of Forest Bath Area

Classification	Total	~'04	'05	'06	'07	'08	'09	'10	'11
No. (places)	163	90	8	10	14	14	10	8	9
Area (ha)	8,403	5,749	325	308	922	246	437	201	215

Source: Korea Forest Service.

The Forest Culture and Recreation Law (enacted on August 4, 2005, enforced on August 5, 2006) was enacted in 2005 and developed so as to contribute to the improvement in living standards of the people by providing forest culture and recreation services that were clean and safe through regulated conservation, use and management of forest recreational resources. To define such a concept of forest recreation, forest culture and recreation is defined as "recreation and healing of body and mind in the forest and a living style which is formed through interaction between human and forest" (Article 1 and 2 of Forest Culture and Recreation Law).

Forest culture, a concept similar to forest recreation, refers to mental activities that realize the ideal of mankind using forests. The forest recreation culture can be seen as a cultural function of the forest formed through recreation activities in the forest. Forest culture is also defined as "recreational culture expressed and shared by the consciousness and behaviors of forest recreation users," expanding forest resource development to the range of human culture and mental relaxation.

5.3. Marketing and Processing of Forest Resources

Since 2004, locally specialized businesses have been promoted through the establishment of collection, processing and marketing systems, as well as the expansion of direct sales between producers and consumers. The main focus was to establish a unified system from production areas to the tables of consumers by expanding the functions of food processing and sales, beyond the mere collection and storage of raw materials. About 150 business places are to be built by 2017. A total of 79 places, including 66 forest product marketing centers in mountain areas, four ornamental tree cultivation complexes, one place for sap display and sales, two places for wild herbs and vegetables, and six marketing centers for forest product-based medicines have been built.

From the past, various items such as wood products, trees, leaves and soil stones or ornamental trees and potted plants have been included among forest products. Currently, there are eight species and 57 items to receive support from the Korea Forest Service as an income-based forest product item based on the Act on the Establishment and Management of Forest Resources, including diverse items such as nuts and fruits, mushrooms, wild vegetables, medical plant, tree leaves, medicinal trees, byproducts and ornamental plants. In forest product production statistics, forest products are divided into 21 species and 189 items.

Table 2-34 | Income-based Forest Product Items to Receive Support

Classification	Name of Forest Production
Nuts and Fruits	Chestnut, Bitter persimmon, Pinenut, Walnut, Jujube, Gingko nut, Acron, *Corylus*, Wild grapes, Tara vine, Rubus fruit
Mushrooms	Oak mushroom, Pine mushroom, Black funges, Umbillicaria
Wild Vegetables	Lance asiabell, Fernbrake, Chinese bellflower, Aster scaber, Angelica, *Hemerocallis*, Bamboo shoot
Medical Plant	Barrenwort, Atracty lodes, White aractylodes, Artemisia, Bupleurum, Peony, Gastrodia, Cultivated mountain ginseng, Cassia
Tree Leaves	Gingko leaves, Pine leaves, Eucommia leaves, Daimyo oak leaves, China root leaves, Kalopanax leaves, Cedreia leaves
Medicinal Trees	Kad sura, Acanthopanax, Cornelian cherry fruit, Chinese matrimony vine, Eucommia, Hovenia, Kalopanax, Redoak
By-products	Sap, Tree barks, Resin, Tree root, Tree shoot
Ornamental Plant	Wild flower, Native orchid, Garden tree, Dwarped plant, Lawn

Source; Korea Forest Service.

The top 10 forest resource product items accounted for about 43% of the total production amount, including oak mushrooms, chestnuts and pine mushrooms which have been identified as particularly important from the past. This trend is expected to continue.

Table 2-35 | Changes in Production Volume and Amount of Top 10 Items (2002, 2007)

(Unit: Value; million Won, Rate of Change - %)

Rank	Item	Unit	2002			2007			Annual Quantity Change	Annual Value Change
			Amount	Value	Ratio (%)	Amount	Value	Ratio (%)		
Total			-	3,016,554	100		3,558,062	100	-	-
1	Ornamental tree	stocks	42,660,802	577,958	19.2	53,455,354	723,988	20.0	4.6	4.6
2	Oak mushroom	kg	21,545,351	141,941	4.7	25,356,644	160,266	4.5	3.3	2.5
3	Bitter persimmon	kg	51,876,480	72,212	2.4	82,117,855	156,130	4.4	9.6	16.7
4	Chestnut	kg	72,405,121	216,491	7.2	77,524,268	138,370	3.4	1.4	-8.6
5	Conifers	m^3	764,182	85,026	2.8	1,142,621	91,293	2.6	8.4	1.4
6	Pine mushroom	kg	373,193	44,734	1.5	479,417	68,246	1.9	5.1	8.8

Rank	Item	Unit	2002			2007			Annual Quantity Change	Annual Value Change
			Amount	Value	Ratio (%)	Amount	Value	Ratio (%)		
7	Raspberry	kg	721,360	2,952	0.1	9,468,566	64,651	1.8	67.4	85.4
8	Jujube	kg	8,537,289	73,002	2.4	7,733,195	62,684	1.7	-2.0	-3.0
9	Lance asiabell	kg	4,640,156	41,510	1.4	5,977,822	60,048	1.7	5.2	7.7
10	Aster scaber	kg	13,085,734	51,867	1.7	19,430,608	55,298	1.6	8.2	1.3

Source: Korea Forest Service. 2002, 2007.

5.4. Characteristics of Forest Resource Development

Since the 2000s, the profitability of timber production has continuously dropped. As it became difficult to guarantee the income of forest owners through timber production alone, and as the influence of local governments increased as a result of the introduction of local autonomy, the government allowed diversified use of forest or integrated forest management to increase the income of forest owners and activate local areas. To this end, the law was revised in 2001, and various support such as financial support was provided. In addition, in 2005, the forest recreation law was enacted, and recreational forests were activated, helping to elevate satisfaction on the use of forest resources of both the general public and forest owners.

6. The Fifth National Forest 10-Year Plan (2008~2017)

As a result of forest rehabilitation and resource management, forest growing stock and timber production increased with the Fifth Forest Master Plan. Meanwhile, expectations regarding the various intangible values of forests, as well as the production of tangible forest products, have also increased, and forest resource development is being promoted as a reflection of this expectation.

In the backdrop of this change, discussions on the forest environment such as the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention on Biological Diversity (UNCBD) and United Nations Convention to Combat Desertification (UNCCD) have been raised as major issues in the world, in line with rising awareness of the issues of global warming, degradation of habitat environments and destruction of the ecosystem. The value of forest resources, which was disregarded in the past, is now being acknowledged, and the need to conserve and develop these resources has increased.

6.1. Utilization of Forest Resources

During the 5-Year Forest Master Plan, income from forestry was among the lowest on record, even among the primary industries. The income of forestry households in 2011 was KRW 28,471,000. This figure is below the income recorded in 2007 (KRW 28,501,000) and only 60.9% of the income of urban workers (KRW 46,724,000), 64.5% of the income of farming households (KRW 30,148,000), and 82.7% of the income of fishery households (KRW 38,623,000).

Table 2-36 | Comparison of Income in Farming, Forestry and Fishery Households

(Unit: 1,000 Won)

Classification	2007	2008	2009	2010	2011	Remarks (2011)
Forestry Household	28,501	27,288	27,391	27,678	28,471	60.9 %
Farm Household	31,967	30,523	30,814	32,121	30,148	64.5 %
Fishery Household	30,668	31,176	33,945	35,696	38,623	82.7 %
Urban Worker	39,398	41,872	41,626	44,041	46,724	100 %

Source: The Statistics Korea.

Table 2-37 | Income of Farming, Forestry and Fishery Households

(Unit: 1,000 Won)

Classification	Forest Household	Farm Household	Fishery Household
Forestry (agriculture, fishery) Income	8,055	8,753	20,432
Expected Income Forestry (agriculture, fishery)	12,317	12,949	11,378
Transfer Income	5,431	5,453	3,309
Non-ordinary Income	2,669	2,993	3,504
Total Income	28,471	30,148	38,623

Source: The Statistics Korea.

The forestry income rate of major lines for five years (2005-2010) decreased in all lines except for the collection business. In particular, income from farming steeply dropped since the management cost such as labor cost for collection increased despite the increase in demand for clean forest products.

Table 2-38 | Income Trends of Forestry

(Unit: 1,000 Won)

Classification	2006	2007	2008	2009	2010	Change ('10/'09)	
						Amount	Rate
Forestry Income	7,470	8,992	8,203	7,654	7,699	45	0.6
Forestry Total Earning	13,952	16,365	15,701	15,825	16,141	317	2.0
Forestry Management Cost	6,482	7,373	7,498	8,170	8,442	272	3.3
Forestry Income Ratio (%)	53.5	54.9	52.2	48.4	47.7	-	△0.7

Source: Korea Forest Service, 2010.

Note: Income= total Earnings - management cost, Forestry income ratio=(income/total earning) × 100.

Table 2-39 | Income Rate by Item

(Unit :%)

Year	Cultivating/ Harvesting	Gathering	Chestnut	Nuts & Fruit	Mushroom	Others	Average
2006	35.9	86.6	54.3	56.2	6.4	57.3	53.5
2010	22.3	74.6	60.1	54.6	11.5	35.9	47.4

Source: Korea Forest Service.

In particular, forestry income totaled KRW 8 million, which is only 30.7% of the income of forestry households. Low income from forestry is a reflection on the Forestry Cooperatives and their inability to increase the income of forestry households through the expansion of markets for forest products and facilitation of distribution.

In 2011, the shipment rates of forest products of Forestry Cooperatives recorded 1.4% in embroidery thread, 0.09% in mushrooms, 0.3% in wild vegetables, 1.8% in chestnuts, 1.3% in oak mushrooms and 32.3% in pine mushrooms. The shipment rates through Forest Cooperatives remain at only 1 % in all items except for pine mushrooms and 0.1% in other mushrooms. Despite the distribution system being based on the Forest Cooperatives,

the growing private distribution sector and participation of professional distribution organizations having large-scale capital and market specialization have put Forest Cooperatives in an inferior position in the distribution sector. This situation calls for a change in government policies and Forest Cooperatives.

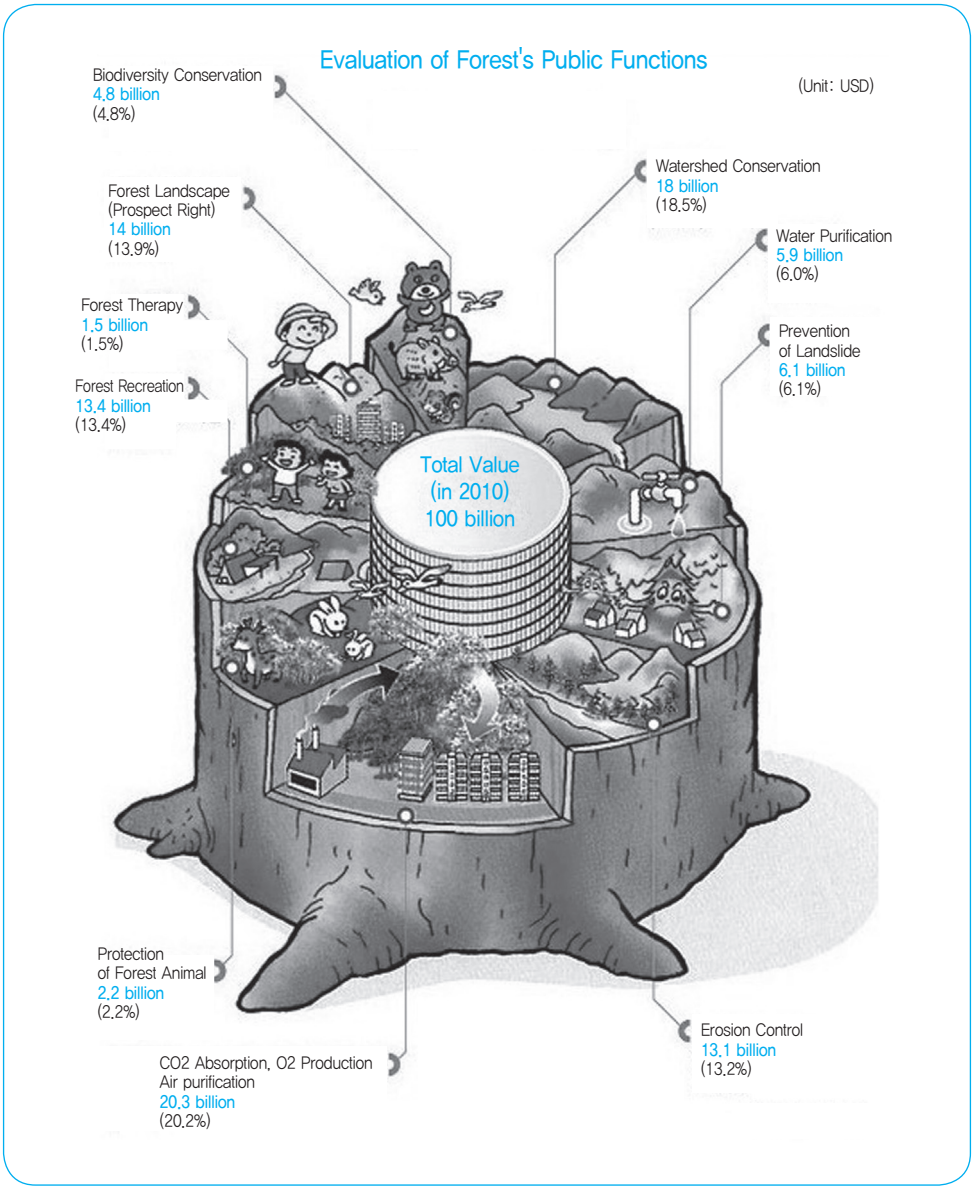
6.2. New Concept in Forest Resource Development

The size of forest area reached 636.9 thousand ha in 2010, which had dropped by 6,032ha compared to the forest size in 2008. However, forest growing stock was 125.6(m^3/ha), which had increased by 21.5% compared to the growing stock in 2008 (103.4m^3). As the growing stock is increasing, public goods and services as well as timber production are also increasing. In addition, due to the increase in international interest to conserve the environment and forest resources, usage and development of forestry are being re-evaluated.

The total appraised value of forest functions of public benefit was KRW 109,007 billion (USD 100 billion) in 2010, having increased by 49% compared to KRW 73 trillion in 2008. The appraised value is 9.3% of GDP, or 3.9 times the total production output of agriculture, forestry and fishery, 19.7 times the total production of output in forestry, and 68 times the budget of the Korea Forest Service (KRW 1.6 billion). The annual per capita benefit is about KRW 2,160,000. Compared to 2000, benefits have doubled. In recent forest resource development, the environmental value of forest resources is continuously being developed, and items with new functions are recognized and added along with the development of tangible products such as timber, fuel-wood and short-term income forest products.

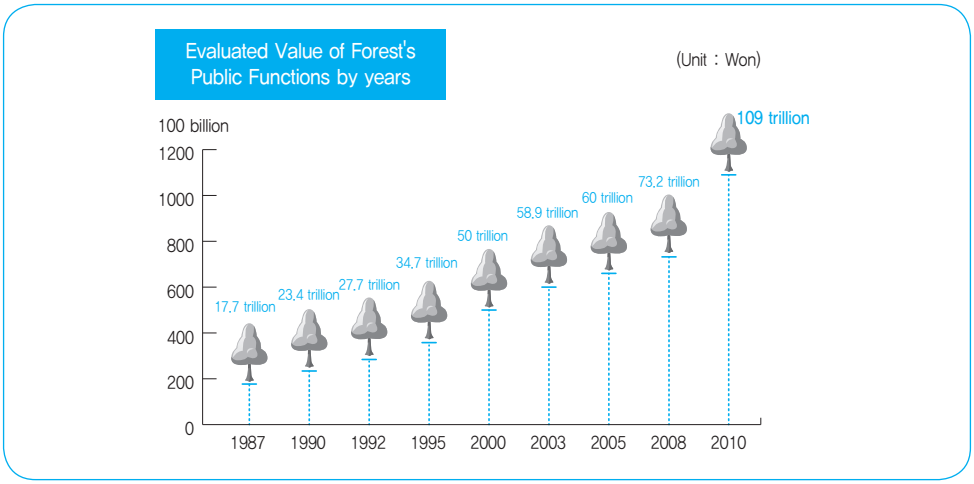
The Korea Forest Research Institute under the Korea Forest Service evaluated six forest functions in the first evaluation in 1987. Seven functions, later adding the water-purifying function, were evaluated in 1995. In the evaluation in 2010, three functions such as conservation of biodiversity in forest, forest landscape and forest therapy were added. The value of seven functions is up to KRW 86,879 billion: watershed conservation is KRW 20,210,200 million (19%), water-purification is KRW 6,547,400 million (6%), prevention of forest soil erosion is KRW 14,335,800 million (13%), prevention of forest landslide is KRW 6,692,800 million (6%), forest recreation is KRW 14,606,700 million (13%), animal protection in forests is KRW 2,423,500 million (2%), and carbon-dioxide absorption and air purification is KRW 22,062,700 million (20%). In addition, the value of the three new functions is up to KRW 22,128 billion. Forest landscape (prospective) is KRW 15,170,800 million (14%), conservation of biodiversity in forests is KRW 5,275,300 million (5%), and forest therapy is KRW 1,681,900 million (2%) (KFRI, 2013).

Figure 2-1 | Evaluated Value of Forest's Public Functions



Source: Korea Forest Service, Korea Forest Research Institute, 2013.

Figure 2-2 | Annual Changes in Evaluated Value of Public Benefits from Forests



Source: Ministry of Security and Public Administration.

Table 2-40 | Trends in Volume, Product Value and Public Value of Forests

Classification	1987	1990	1992	1995	2000	2003	2005	2008	2010
Forest Volume (m^3/ha)	30.9	38.4	42.1	47.9	63.5	73.1	79.2	103.4	125.1
Volume Increase Rate (%)	100	124	136	155	205	237	256	335	405
Forest Production Amount (FPA) (Trillion Won)	0.7	0.7	0.8	1.0	2.9	3.2	3.2	4.1	5.5
FPA Increase Rate (%)	100	100	114	142	414	457	457	585	787
Forest Welfare Function Amount (FWA) (Trillion Won)	17.7	23.4	27.7	34.7	50.0	58.9	66.0	73.2	109.0
FWA Increase Rate (%)	100	132	156	196	282	332	372	413	615

Source: Korea Forest Research Institute.

These public values of forest resource development will be used as baseline data for the introduction and implementation of Payments for Ecosystem Services of forest (PES)[8], which is being promoted internationally. The PES refers to all types of contracts, by which the beneficiary of forest ecosystem services pay service suppliers.

6.3. Characteristics of Forest Resource Development

In the 21st century, the tangible production value of forest resources is continuously reduced, and direct benefits to forest owners are also decreasing. However, as the volume of forest growing stock is increasing and its conditions improve, various intangible values of forests tend to continuously increase – up to 20 every year. While the return value of tangible forest resource development is limited to forest owners, the value of intangible forest resource development is evenly distributed to all people in the country. Intangible values include watershed conservation, water purification, prevention of oil erosion, prevention of forest landslides, forest recreation, animal protection in forests, carbon-dioxide absorption and air purification, forest landscaping (prospective), conservation of biodiversity in forests, and forest therapy. Government legislation, policies and institutions are continuously being established, and various financial support is being provided. In addition, the government is trying to implement modern upgrades such as the forest environment direct payment system – a part of which is been already implemented.

There are various kinds of forest resources in South Korea, and the importance and roles of forest products have varied by period as examined in Chapter 2. This chapter briefly describes the development background and needs, development strategies and systems, success factors and cases, and implications for developing countries regarding major forest resource items including timber, fruit trees, forest mushrooms, and collectable forest resources, which contributed greatly to national economic development, territorial integrity, and forest sources of income development.

8. Payments for Ecosystem Services of forest (PES) refers to all forms of contracts by which beneficiaries of the service pay for service providers.

Chapter 3

Major Forest Resource Development Systems by Product Item

Major Forest Resource Development Systems by Product Item

1. Timber Resources

1.1. Forest Resources

1.1.1. Status of Forest Devastation

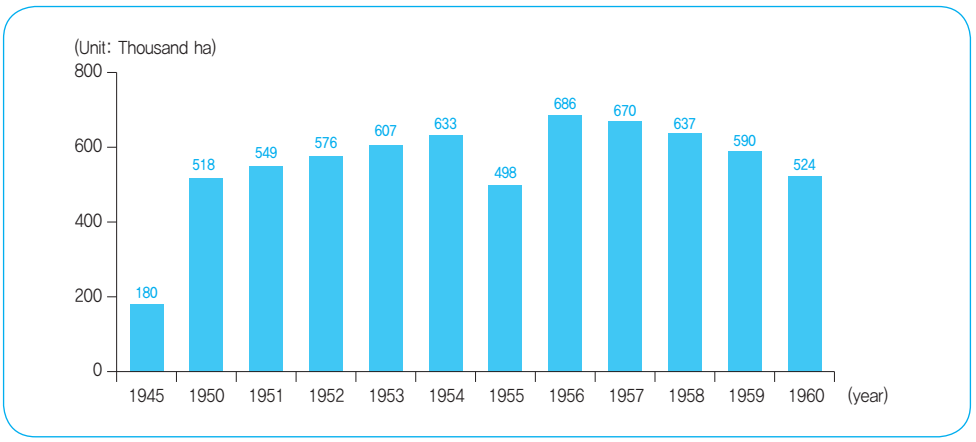
In 1945, the area of devastated forest land in South Korea reached 180,000ha. The area of devastated forest had been increasing every year during the social chaos period, rising by three times during the 10-year period, finally reaching 686,000ha in 1956. Growing stock in South Korea was only 8m³/ha in 1954 and 10m³/ha in 1970.

Meanwhile, the amount of timber production had increased to 203,000m³ in 1950, 423,000m³ in 1955, and 503,000m³ in 1965. The poor condition of forest resources and the supply of timber by harvesting forest trees were major concerns regarding forest resource management.

However, national timber demand inevitably increased.[9] Even though the government inhibited harvesting forest trees, deforestation with permission was on the rise by any means necessary. Thus, unplanned timber production was a contributing factor to forest devastation.

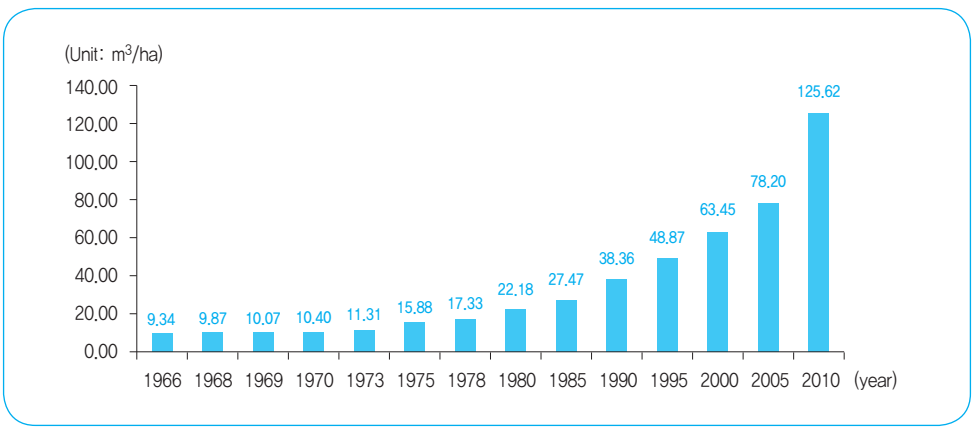
9. Much of the timber demands came from the need to use materials for construction, civil engineering, furniture, telephone poles, war supplies, mines, vehicles, pulp, shipbuilding, fishery and far wood. The need for stationery, sports goods, matches, arrows and toys were only a few examples.

Figure 3-1 | Forest Devastation Area



Source: Korea Forest Service, 1997.

Figure 3-2 | Forest Growing Stock



Source: Korea Forest Service, Forest Statistics Yearbook.

1.1.2. Status of Forest Resources

a. Forest Area

In 1960, total area of forest lands in South Korea reached 6,757,000ha. Forest lands in South Korea were occupied by 1,417,000ha of national forests (21% of total forest lands), 572,000ha of public forests (8%), and 4,768,000ha of private forests (71%). In 1965, the total area of forest lands declined to 6,689,000ha, which was a decrease of 88,000ha

compared to the area in the year 1960. The area of national forests decreased by 143,000ha, but the area of private forests increased by 117,000ha. The reason why total forest area decreased could be attributed to forest land conversion to agricultural lands, housing, and industrial lands. The area of national forests decreased because they were sold or transferred to private forests. Thus, private forests had become more important than others, and the core of forest policies should be focused on private forest related policies.

b. Growing Stock

In 1960, the total amount of growing stock in South Korea was 63,995m³. When viewed by ownership, growing stock in national forests was 23,042,000m³ (36% of total growing stock), and the amount of growing stock for public and private forests were 6,769,000m³ (11%) and 34,184,000m³ (53%), respectively. The amount of growing stock for private forests consisted of a large proportion of the total growing stock in South Korea.

However, the total growing stock increased into 68,773,000m³ in 1970. The amount of growing stock for national forests increased into 34,307,000m³ (50%), which was 11,265,000m³ more than the amount of growing stock in 1960. But the amount of growing stock for public and private forests decreased by 1,729,000m³ (7%) and 4,759,000m³ (43%), respectively.

Table 3-1 | Forest Size by Ownership

(Unit: 1,000ha)

Year	Total	National Forests					Public Forests	Private Forests
		Sub-total	Under Custody of Korea Forest Service			Under Custody of Other Govt. Authorities		
			Sub-total	Indisposable	Disposable			
1951	6,469	1,243	753	504	249	491	565	4,661
	100%	19	11	8	4	8	9	72
1960	6,757	1,417	1,377	911	466	40	572	4,768
	100%	21	20	14	7	1	9	71
1970	6,667	1,287	1,157	885	273	130	493	4,886
	100%	19	17	13	4	2	7	73
1990	6,476	1,460	1,346	-	-	114	489	4,625
	100.0%	23	21	-	-	2	8	71
2010	6,369	1,543	1,410	1,353	56	133	488	4,338
	100.0%	24	22	21	1	2	8	68

Source: Korea Forest Policy Society, 1975.

Table 3-2 | Forest Growing Stock by Ownership

(Unit: 1,000m³)

Year	Total	National Forests					Public Forests	Private Forests
		Sub-total	Under Custody of Korea Forest Service			Under Custody of the Other Govt. Authorities		
			Sub-total	Indisposable	Disposable			
1960	63,995	23,042	22,649	18,147	4,502	394	6,769	34,184
	100(%)	36	35	28	7	1	11	53
1970	68,773	34,307	33,177	29,673	3,504	1,130	5,040	29,425
	100(%)	50	48	43	5	2	7	43
1990	248,426	85,160	80,539	-	-	4,620	18,111	145,155
	100(%)	34	32	-	-	2	7	58
2010	800,025	229,113	213,528	205,986	7,541	15,585	60,179	510,734
	100(%)	29	27	26	11	2	8	64

Source: Korea Forest Service, Forest Statistics Yearbook.

Currently, the total amount of growing stock in South Korea in 2010 was 800,025,000m³. This consists of 229,113,000m³of national forests (29%), 60,179,000m³ of public forests (7%), and 510,734,000m³ of private forests (64%). The growing stock of private forests had greatly increased to 64% of total growing stock in South Korea, attributable to the resource proliferation policy.

Table 3-3 | Growing Stock by Age-Class

(Unit: thousand m³)

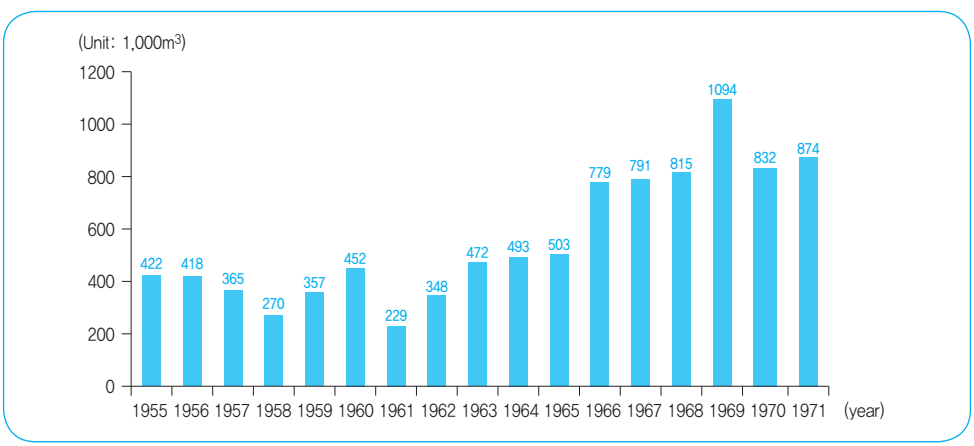
Year	Total	I (1~10)	II (11~20)	III (21~30)	IV (31~40)	V (41~50)	VI (51~60)	VII (61~70)	VIII (71~80)	IX~ (81~)
1967	63,746	2,733	17,641	26,786	11,269	3,424	1,009	404	223	256
	100(%)	4	28	42	18	5	2	1	0.3	0.4
1970	68,773	2,939	18,832	26,954	14,085	3,959	1,022	444	240	296
	100(%)	4	27	39	21	6	2	1	0.3	0.4
1973	74,466	3,232	20,977	29,621	14,584	4,019	1,001	468	249	316
	100(%)	4	28	40	20	5	1	1	0.3	0.4
1990	248,230	2,673	103,099	80,701	42,957	14,003	4,993	-	-	-
	100(%)	1	42	33	18	6	2	-	-	-
2010	800,025	-	26,672	157,316	306,880	218,074	91,083	-	-	-
	100(%)	-	3	20	38	27	11	-	-	-

Source: Korea Forest Service, Forest Statistics Yearbook.

Note: Class VI indicates higher than class VI after 1975.

Forest trees higher than age-class IV are generally harvested for timber production. Before and after the 1970s, the composition of forest age-classes was not appropriate for timber production in South Korea. Nevertheless, the amount of cutting quantity had been increasing every year in the 1960s to 503,000m³ in 1965, 1,094,000m³ in 1969, and 874,000m³ in 1971. Trends in timber production around the 1960s are indicated in [Figure 3-3].

Figure 3-3 | Timber Production by Harvesting Forest Trees



Source: Korea Forest Policy Society, 1975.

1.1.3. Implications

Until the beginning of the 1960s, forest growing stock in South Korea was less than 10m³/ha. In terms of forest area by ownership in 1960, the area of private forests occupied 71% of total forest area, while the growing stock of private forests occupied only 53% of total growing stock. The area of national forests consisted of just 21% of total forest area, but their growing stock was 36% of total growing stock. The main target of forest resource proliferation were private forests in South Korea at that time.

Timber resource promotion policies in South Korea can be summarized by the following four factors. First, the formation of social consensus for forest restoration was a driving force for the establishment of government-initiated intensive forest policies. Second, political consideration for private forests was required, understanding the fact that more than 70% of forest area was private. Third, the efforts were made to solve the problem of unequal distribution of growing stock by age-class; and to normalize its distribution in terms of forest management. Finally, sustainable forest policies including tending treatments and fertilization for young-stands were established.

1.2. Timber Resource Promotion Projects

In the 1960s environment of low forest accumulation and high demand for timber, South Korea was about 10% self-sufficient in timber at that time. To improve this situation, the basic direction of timber supply and demand was established for forest resource proliferation and conservation, in addition to the initiation of timber resource promotion projects.

First, domestic timber production and supply were limited to less than 15% of annual diameter growth, and industrial timbers, such as mine timber and pulpwood, should have priority in supply. Second, it was necessary to raise the availability of hardwood by rationing the usage of timber resources and make other consumption saving accommodations. Third, substitute industry development was promoted to save on timber by using different materials when possible. Finally, foreign timber was actively imported to make up for the shortage of domestic timber supply. In addition, the government recommended that people who cut forest trees afforest the following year, and people who use a lot of timber should own their forest and conduct afforestation accordingly.

1.2.1. Readjustment of Slash-and-Burn Fields

a. Background and Promotion History

Slash-and-burn is an agricultural technique that involves cutting and burning forest trees by selecting fertile forest land. After forest land has been reclaimed and cultivated, people move to other places repeatedly once the fertile topsoil is lost. Thus, forest deterioration by slash-and-burn was significant.

In 1965, the number of slash-and-burn farming households totaled 70,500, the total population was 420,000, and the area of slash-and-burn fields was about 40,000ha. Slash-and-burn fields scattered throughout the entire forests lead to massive forest devastation, threatening territorial integrity, hindering forest management, and bringing about forest disasters. Therefore, the government created a base for cracking down on slash-and-burn in the Forest Law and the Forest Protection Act, and also made an effort to prevent the expansion of slash-and-burn fields.

The government made 3,000 slash-and-burn households in 1965, and 1,800 households in 1966 move to other places with the slash-and-burn farmers resettlement project. Afterward, the Readjustment of the Slash-and-Burn Fields Act as a special law was established for preventing recurring slash-and-burn fields (1966. 4. 23 Law 1778) and played a role to systematically promote readjustment of slash-and-burn fields.

Figure 3-4 | Slash-and-Burn Fields in the Early 1970s

Source: Korea Forest Service.

Figure 3-5 | Residential Areas of Slash-and-Burn Farmers in the Early 1970s

Source: Korea Forest Service.

In addition, an actual condition survey (1967~1968) was implemented for slash-and-burn fields based on the Readjustment of the Slash-and-Burn Fields Act. Based on the results of the survey, the project of moving slash-and-burn farmers living in threatened areas was carried out, but the outcome was insignificant.

The full-scale slash-and-burn fields readjustment project was implemented by special instruction of President Park Chung-hee in 1973. By establishing the "Readjustment of Slash-and-Burn Fields 5-Year Plan," slash-and-burn fields were arranged until 1979. As a result, 124,643ha of slash-and-burn fields were arranged until 1979.

b. Achievements of the Slash-and-Burn Fields Rearrangement Project

This project had been implemented from 1973 to 1979 for 7 years, and the criteria for slash-and-burn fields rearrangement were as follows:

a) Slash-and-Burn Fields Rearrangement Policy

• Slash-and-Burn Fields Rearrangement

Fields with less than a 20 degree slope could be used as agricultural land, and fields with more than a 20 degree slope should be restored to forests.

• Slash-and-Burn Fields Farming Households

Households located in forests with more than a 20 degree slope qualified for the move and relocation and were forced to move to other places. Households located in forests with less than a 20 degree slope could settle in current residential areas.

① Move: Support amounted to KRW 400,000 provided for moving expenses to slash-and-burn households within forest restoration regions. These households were forced to move to other cities and areas by order of the mayor or county governors.

② Relocation: Support in the amount of KRW 200,000 provided for house building expenses to slash-and-burn households within forests, forced to move to existing villages.

③ Settlement: Support to settlement households so that they earn a living by working with income businesses and local public projects including seedling, sericulture, and native cattle breeding.

b) Achievements of Slash-and-Burn Fields Rearrangement

The arranged area of slash-and-burn fields to forests or agricultural lands totaled 125,000ha by 1979. Of this area, the area arranged to forests was 86,000ha, and the area converted to agricultural lands was 39,000ha.

Additionally, the best follow-up service was provided to prevent the recurrence of slash-and-burn fields and related agricultural activities in the fields by conducting annual regular inspections.

Moved or relocated slash-and-burn farming households could receive support in the form of an employment promotion project to maintain living standards before readjustment of slash-and-burn fields.

Table 3-4 | Achievement of Slash-and-Burn Fields Rearrangement

(Unit: ha, household)

Classification	Total Business Volume	Until '73	1974	1975	1976	1977	1978	1979
Slash-and-burn Fields	124,643	17,424	10,765	24,434	47,105	16,168	7,930	819
Forest Restoration	86,073	11,900	7,773	18,680	28,385	10,968	7,547	819
Agriculture Lands	38,507	5,524	5,524	5,254	18,719	5,200	382	-
Number of Slash-and-burn Households	330,796	33,495	37,626	91,891	89,136	41,678	6,970	-
Move	25,857	10,563	3,173	3,869	3,876	2,273	2,103	-
Relocation	2,349	-	332	668	630	523	196	-
Settlement	272,590	22,932	34,121	87,354	84,630	38,882	4,671	-

Source: Korea Forest Service, 1996.

c. Implications

The forest restoration area of slash-and-burn fields was only 1% of the total forest area in South Korea, but the effect of slash-and-burn field readjustments was significant in conserving national lands, including the prevention of national land loss, forest devastation, and forest disasters.

Considering that the annual amount of soil runoff in slash-and-burn fields was 3.23 ton per ha, the program realized an annual reduction of 400,000 tons of soil runoff in 125,000ha of slash-and-burn fields. Readjustment of slash-and-burn fields could be evaluated in terms of helping to prevent soil runoff and reducing the damage of flooding and droughts. The government recommended installation of grasslands and drains for the prevention of soil erosion in slash-and-burn fields with less than a 20 degree slope and provided legitimate sites for slash-and-burn farmers to live.

Readjustment of slash-and-burn fields was one of the projects to mitigate chronic landslides, floods and droughts in the process of promoting forest greening in the 1970s and 1980s.

The success of slash-and-burn field readjustment projects was the result of high-level administrative enforcement and a national unified vision, accompanied by budget support in the end of the 1970s, which was the rapid growth period of the Korean economy.

1.2.2. Cooperative Management Project for Private Forests

a. Background and History

The cooperative management project for private forests began in 1974, which was during The First National Forest 10-Year Plan (1973~1978). In September 1966, Korea and Germany concluded a technical cooperation agreement, and the pilot project for private forest cooperative management began with a separate contract for forest business between two countries in July 1974. The Korea-Germany forest management business organization was launched in Seoul (the current location of the Korea Forest Research Institute) in 1974. The cooperative management project for private forests had been implemented by the Korean German Forest Management Project organization (KGFMP).

The KFGMP opened the Yangsan Forest Management Station in Soonji-ri, Habook-myun, Yangsan-gun, Gyeongnam in May 1975, and it conducted pilot projects for private forest cooperative management with Korean and German forest specialists.

In addition, the cooperative management project for private forests was started in 1974, and the project was enacted under the Forest Law Article 40 in January 1980, which stipulated that "the Administrator of the Korea Forest Service shall encourage collaborative forestry management between the owners of small private forests to promote rational management of private forests." The Act also required that "the Administrator of the Korea Forest Service shall support the cost of afforestation and silviculture, and other technical instructions for collaborative forestry management of small private forests based on Article 40."

Later, the content for the Forest Law was partly revised in January 1990, and the Forestry Development Promotion Act (1977. 4. 10) was enacted, including the article for private forest cooperative management.

b. Promotion of the Pilot Project at the Yangsan Forest Management Station

The Yangsan Forest Management Station conducted not only private forest cooperative management but also forest investigations, forest work technical development and education, and test projects.

In the private forest cooperative management project, basic forest investigations, including forest stand conditions and geogen, was implemented for 4,800ha of forest within the project districts by Korean and German forest specialists. The investigations also examined and analyzed the management structure of private forests including forest ownership, forest owner status, and socio-economic conditions within the project districts.

After analyzing the research data for basic forest investigations and private forest management structures in 1976, the research output recommended that it was necessary to

organize self-driven cooperative management of forest land owners, as well as send forestry technical experts to supervise and foster cooperative groups of forest land owners for the improvement of private forest management in South Korea. The forestry business should be implemented by forest land owners of cooperation management groups based on forest management plans and under the instruction of forestry technicians.

The Yangsan forest management station had organized cooperative management groups for forest land owners by sending forest professional instructors to target areas of pilot projects since 1977. Forest professional instructors lived with local residents and performed publicity activities for forestry, explaining the need for and benefits of forest land owners' cooperative management organizations.

As a result, South Korea organized the "Seohari timber forest cooperative management group" in Seoha-ri, Dooseo-myun, Uljoo-gun, in December 1977, for the time in the history of forest administration. Afterward, cooperative management groups were organized at Soho-ri, Naewa-ri, Cha-ri, and Guryang-ri. From 1979, the name of the cooperative management groups was changed to "Forest Management Cooperatives."

c. Achievement of the Pilot Project in the Yangsan Forest Management Station

The Yangsan forest management station implemented afforestation programs for a total of 668ha from 1977 to 1984. The station also initiated silviculture activities, including fertilization, mowing, and harvesting by thinning 3,954ha, and tentatively opened forest roads as part of the management infrastructure.

In addition, cooperatives promoted the development projects of short-term income infrastructure such as cooperatives' warehouses, and cultivated facilities by receiving financial support and technical guidance. The appraised value for common properties owned by cooperatives was around KRW 10 million per cooperative.

Table 3-5 | Organization Status of Private Forest Cooperatives by Provinces (1984)

Province	Number of Cooperatives	Private Forests		Joined Cooperatives			
		Area (ha)	Forest Land Owners (Number)	Area (ha)	Area Ratio (%)	Forest Land Owners (Number)	Forest Land Owners (%)
Total	34	37,558	7,016	9,056	24	1,095	16
Gyeonggi	6	5,161	481	2,631	51	212	44
GangWon	4	4,589	703	1,290	28	120	17
Chungbuk	5	4,134	889	801	19	142	16
Chungnam	4	4,994	994	802	16	109	11
Jeonbuk	3	4,810	998	914	19	130	13
Jeonnam	5	3,909	1,134	1,090	28	136	12
Gyeongbuk	3	5,436	935	886	16	140	15
Gyeongnam	4	4,525	882	642	14	106	12

Source: Korea Forest Service, 1989.

In summary, private forest cooperative management was successfully implemented through the spontaneous participation of forest land owners who participated in the organization and operation of cooperative management and diligent guidance activities of instructors.

d. Promotion of Cooperative Organizations

The government made plans and encouraged expansion of private forest management projects all over the country after the completion of Korean-German technical cooperation in April 1984. According to the plan, pilot projects were extended to 24 stations (3 per 8 provinces) until 1988, which was the target year for the Second National Forest 10-Year Plan. These stations then played the role of bases from which the activities spread to surrounding areas.

Table 3-6 | Regional Expansion Results of Cooperatives

Year	Number of Regions (County)	Number of Cooperatives	Forest Area (ha)	Number of Instructors	Per Instructor	
					Number of Cooperatives	Forest Area (ha)
1984	8	34	37,558	35	0.97	1,085
1985	8	34	37,958	35	0.97	1,085
1987	12	53	57,650	60	0.88	961
1989	16	58	80,190	70	1.83	1,146
1990	25	78	141,845	76	1.03	1,866
1992	42	140	311,311	85	1.65	3,662
1994	44	187	423,294	85	2.20	4,979
1995	44	202	430,024	85	2.38	5,059
1997	45	232	500,242	85	2.73	5,885
1998	45	247	519,416	85	2.91	6,111

Source: Korea Forest Research Institute.

The number of cooperative organizations sharply increased from 1984 (34 stations) to 1998 (247 stations). Forest area joined by cooperatives during the same period increased from 9.284ha to 173,676ha, and the number of forest land owners joined in cooperatives increased from 1,121 to 26,209 – marking a 23-time increase.

e. Achievement of Cooperative Management Groups

Forest projects implemented within cooperative project districts not only encouraged the proliferation of forest resources, including growing stock, but also helped to create employment opportunities and increase labor income through the participation of cooperatives-joined forest land owners.

Particularly in the case of forestry businesses in areas operated by cooperatives, forest land owners autonomously made decisions regarding the volume of business based on cooperative forest management plans. This made it possible to work in forest work groups. Therefore, the quality of forest work was also relatively high.

On the other hand, the establishment of cooperatives rapidly increased, but the cooperative technical guidance of instructors was weakened in quality due to the decrease in national support and the increase in the number of cooperatives in charge of the instructors. This situation resulted in poorer results from cooperative management projects.

f. Implications

In 1974, the private forest cooperative management project made an innovative change in Korean forestry administration history. The government adopted the cooperative management project to promote increase in forest income based on the proliferation of forest resources and the activation of private forest management. This project became the model for forest management through the organization of cooperatives and direct participation of forest land owners – which differed from the role of the forest village associations for forest conservation and restoration.

Cooperatives played a key role in the management and policy promotion of private forests. Private forests management in Korea was difficult due to the small scale of ownership, long-term and low-profit investments, and the lack of forestry techniques and financial resources. In these circumstances, cooperatives (cooperative management project) could be evaluated as an alternative policy for forest management with the increased economies of scale by collectivizing small forests.

The reason for the depression in cooperative management projects was decreased national support (from KRW 11,555,000 in 1990 to KRW 4,741,000 in 1998) and lower quality of instruction due to the increase in the number of cooperatives for cooperation instructors (1 cooperative to 3 cooperatives per instructor; or from 1,000ha to 6,000ha per instructor in forest areas). The lack of legal personalities and expertise within the actual cooperatives also led to difficulties in managing income, consignment businesses, and properties, thereby weakening the motivation of management.

1.2.3. Forest Work Groups

a. Organization of Forest Work Groups for Private Forest Cooperative Management

a) Background for the Organization of Forest Work Groups

Forest work groups were created in the process of promoting cooperative projects at Yangsan station, which was the origin of a Korean-German private forest cooperative project. They were organized to implement effectively forest works in cooperative management business areas. Forest group workers were trained in the basic technical theories of forestry and forest work machines and equipment in pilot cooperative management guidance offices.

b) Organization and Achievement of Forest Work Groups in Private Forestry

• Cooperative Management Guidance Offices

The number of forest work groups organized in cooperative management guidance offices was 11 in eight provinces until 1986, and the number of forest group workers was 106. Forest group workers were technicians who completed a basic level of education in

forestry and forest work techniques. <Table 3-7> shows the organization status of forest work groups in 1986.

Table 3-7 | Achievement of Forest Work Groups in the Private Forest Cooperative Management Guidance Office (1984~1986)

Province	Forest Work Groups		Work Types				Total Labor Income (thousand Won)
	Number of Groups	Number of Forest Workers	Ground Clearance (ha)	Afforestation (ha)	Silviculture (ha)	Harvesting Forest Trees (ha)	
Total	11	106	153	127	1,346	305	144,877
Gyeonggi	1	12	-	-	219	57	7,103
GangWon	1	12	70	60	262	45	55,499
Chungbuk	1	12	3	4	204	9	18,903
Chungnam	1	9	-	-	170	35	18,023
Jeonbuk	1	12	40	1	131	60	9,466
Jeonnam	1	10	-	-	82	9	3,452
Gyeongbuk	1	10	37	23	97	64	14,636
Gyeongnam	4	29	3	39	181	26	17,795

Source: Korea Forest Service, 1989.

As shown in <Table 3-7>, profits from forestry works in cooperative work groups from 1984 to 1986 totaled KRW 144,877,000, and the average wage for a worker per day was KRW 11,060. The total number of days worked in forestry by cooperative groups was 1,729, and the annual manpower input was 13,095 people.

b. Progress of Forest Work Groups

a) Background and History

Forest work groups originated in private forest cooperative management organizations created in the process of developing Korean-German forest management projects. At the beginning of the 1970s, the urban concentration of the population with rapid industrialization caused a severe shortage of workers in agricultural and mountainous villages. In addition, the improved standard of living also made people reluctant to work on forest land. Securing professional technicians had become a new task for the mechanization of forest labor and the improvement of productivity.

Under these circumstances, the government actively developed policies for encouraging forest work groups and for systematic technical education for forest workers in order to secure professional forest labor. In 1982, a forest machinery training center was established to conduct initial training for forest management technicians, and the national forestry cooperative federation organized forest work groups with people who completed the training.

Forest work groups also found a legal basis in the Act on the Promotion of Forestry and Mountain Villages. The title of forest work groups was changed to the forest management technician group and organized on a national scale.

Table 3-8 | Organization Status of Forest Work Groups
(Forest Management Technician Groups)

Classification		1995	2000	2005	2006	2007
Total	Number of Forest Work Groups	216	435	552	524	522
	Number of Forest Workers	2,652	5,157	6,539	6,052	5,876
National Forests	Number of Forest Work Groups	44	117	138	138	146
	Number of Forest Workers	528	1,505	1,811	1,767	1,712
Private Forests	Number of Forest Work Groups	172	318	414	386	376
	Number of Forest Workers	2,124	3,652	4,728	4,285	4,164

Source: Korea Forest Research Institute, 2008.

b) Organization Status of Forest Work Groups (Forest Management Technician Groups)

The number of forest work groups reached 522 forest management groups in 2007, and the number of professional forest workers was 5,876. The number of forest work groups showed a growing trend until 2005, after which point the number began to decline in 2006.

c) Achievement of Forest Work Groups (Forest Management Technician Groups)

When examining the achievement of forest work groups, the forest work area implemented by forest work groups totaled 236,000ha, which was 44.7% of the total forest business volume of 528,000ha.

In terms of the type of projects conducted by forest work groups, 44% was afforestation, 64% mowing, 46% tending to young growth, 72% thinning, 43% natural forest caring, and 34% pest control.

d) Income of Forest Work Groups (Forest Management Technician Groups)

The average annual income of forest group workers decreased by KRW 1,418,000 for a total KRW 15,865,000 in 2007 compared to the average annual income in 2005. The average monthly income also fell by KRW 118,000 to KRW 1,322,000, compared to KRW 1,440,000 in 2005.

The decrease in income for forest group workers was because the number of annual working days was reduced by 92 days to 1,064 days, compared to 1,156 days in 2005. Additionally, the amount of thinning work, which had relatively high working expenses, also decreased. However, the average annual income for forest group workers in 2007 had increased year by year compared to KRW 626,000 in 2000 and KRW 823,000 Won in 2003.

Table 3-9 | Income of Forest Work Groups

Year	Annual Working Days	Number of Forest Work Groups	Number of Forest Workers	Total Project Expenses (million Won)	Average Annual Income of Forest Work Groups (thousand Won)	Average Annual Income per a worker (thousand Won)	Average Monthly Income per a worker (thousand Won)
2000	973	435	5,157	38,787	89,051	7,512	626
2003	1,104	512	5,969	56,609	110,565	9,484	823
2005	1,156	551	6,649	114,916	208,559	17,283	1,440
2007	1,064	522	5,876	249,374	178,592	15,865	1,322

Source: Korea Forest Research Institute, 2008.

c. Implications

Agricultural and mountainous labor generally moved to large cities in the process of industrialization. Labor forces located around forests rapidly decreased. Forest works were usually also considered 3D jobs and were carried out in remote areas. Additionally, there was less stability as a occupation because forest work did not take place throughout the year.

Therefore, organizing forest work groups with people who completed the education courses to acquire forest work knowledge and techniques were advantageous in terms of contributions to the improvement of quality in forest works, as well as the stable supply of labor.

In addition, the specialization of forest work contributed to the creation of employment opportunities for agricultural and mountainous labor even though income from forest work would be less than others.

1.2.4. Industrial Forest Ownership Order System

a. Background

To construct the infrastructure for timber self-sufficiency, the Forest Law (No.2197) regulated that companies using forest products as raw materials should possess their own forests as industrial forests. However, system was not enforced as many companies could not afford to purchase their own land. Given this situation, constructing the infrastructure for timber self-sufficiency became an urgent issue with the energy crisis. The government recommended that paper and coal mining companies should possess their own forests.

b. Working Progress

In 1977, the government legislated the "Industrial Forest Implementation Guidelines" (Korea Forest Service, Regulation 149, on 14, Oct. 1977), which included the criteria for and other details regarding ownership of industrial forests. The Guidelines ordered 23 new companies to possess 10,990ha of forest. Among the 77 companies that received ownership orders in 1974, the government also ordered 30 companies that were experiencing an increasing use of timber to have an additional 19,940ha of forest. Finally, 100 companies received orders to possess a total of 113,960ha.

In 1979, areas of industrial forests totaled 130,704ha by 39 companies, exceeding ordered ownership areas. However, only 39 companies owned industrial forests among the 100 target companies. This figure showed that the industrial forest ownership order would not apply to small companies.

Therefore, in the Forest Law, the selection criteria of target companies for industrial forest ownership orders was changed to companies that used more than 5,000m^3 of timber per year

(Revised on 4 Jan. 1980). The Forest Law also added that those companies that did not carry out the possession order should perform afforestation in national and public forests. The "Industrial Forest Implementation Guidelines" (Korea Forest Service, Regulation 213, on 15, Dec. 1980) were also revised based on these situations.

Table 3-10 | Possession Results of Industrial Forests

Classification	Number of Companies	Possession Orders (ha)				Possession Results (ha)		
		Total	1975	1976	1977	1974	1975	1976
Total	77	83,530	33,412	25,059	25,059	65,386 (78%)	86,180 (103%)	112,966 (135%)
Paper	5	32,250	12,900	9,675	9,678	26,798 (83%)	35,413 (110%)	58,443 (181%)
Mining	72	51,280	20,512	15,384	38,588	38,588 (75%)	50,767 (99%)	54,523 (106%)

Source: Korea Forest Service, 1989.

With the revision of the Forest Law and the Industrial Forest Implementation Guidelines, industrial forest possession orders dated before December 30, 1977, were canceled, and a new industrial forest possession order dated May 26, 1981, was issued to 25 companies after investigating companies that used more than 5,000m^3 of timber per year.

Table 3-11 | Possession Order of Industrial Forests in 1997

Classification	Number of Companies	Area of Possession Orders (ha)
Total	100	113,490
Paper Companies	6	32,490
Mining Companies	25	55,640
General Companies	9	6,390

Source: Korea Forest Service, 1989.

c. Implications

The industrial forest possession order system is a modern version of enforcing corporate social responsibility. Companies that used timber for the production of their products can contribute to social restoration by 1) using their profits to purchase and own forests, 2) contributing to the proliferation of forest resources with planned afforestation projects, and 3) implementing sustainable forest management with controlled harvesting of forest trees.

However, this system did not reap significant results because there was 1) no consideration for the unique financial conditions of each company, 2) no clear goals for forest management and 3) fundamental limitations for companies in obtaining sufficient timber.

Given today's emphasis on corporate social responsibility, the industrial forest possession order system has an opportunity to add meaningful value to this principle. Instead of an existing top-down communication method, a horizontal consultation system should be applied to encourage collaboration among enterprises, governments, and local societies.

1.2.5. Forest Tending Public Projects

a. Background of Forest of Life

At the end of 1997, economic retrenchment and restructuring led to a severe unemployment problem during the IMF crisis of the national economy. The "Forest of Life" project was developed and promoted to provide jobs for the unemployed, and to maximize the various functions of forestry through forest tending projects.

The "Forest of Life" was similar to the CCC (Civilian Conservation Corps: a private organization for natural conservation and promotion), which was implemented during the economic depression period of the 1930s in the United States. This project contributed to 1) the employment of unemployed people suffering from the IMF economic crisis and 2) the construction of forests as valuable economic and environmental resources.

b. Forest Tending Project Plan

Forests with a high impact on employment became the main target areas of forest gardening projects. Focusing on large-size economic forests, forest tending works were implemented differently using existing systems and processes within forest work. In addition, forest work aimed to make the best use of production goods, as well as support the settlements of employees who sought technical education in forestry and to return to the farm.

a) Recruitment Announcement and Application of Employees

Cities and provinces were in charge of the recruitment of employees for forest tending projects within their jurisdiction. Cities and counties posted the selection criteria, work areas, wage levels, and other information through the local press and media.

Table 3-12 | Budget Size and Employment Plans for Forest Gardening

Classification	Total	Tending Forest Trees					Forest Maintenance in Suburbs		
		Sub-total	Thinning	Tending Natural Forests	Removing Vines	Education and Equipment	Sub-total	Mountain Trail Maintenance	Forest Cleanup
Budget (Million Won)	39,542	31,900	4,579	12,192	10,943	4,186	7,642	4,328	3,314
Annual Workers by Employment (1,000people)	1,000	730	120	320	290	-	270	150	120
Regular Employment (Number of People)	7,000	5,000	900	2,150	1,950	-	2,000	1,100	900

Source: Korea Forest Service, 1998.

b) Selection and Training Education of Potential Employees

A potential employee is someone between the ages of 31 to 50 and in good health, who has applied for more than three months and who is not a recipient of current unemployment benefits or who has the expired unemployment benefits. However, for projects related to mountain trail maintenance and forest cleanup, participants were selected from people between 31 to 55. In particular, candidates who desired to return to the farm and had some connections to the project areas were chosen over the other candidates.

The potential employees for tending operations should have the necessary education and training of general forest work, forest equipment instruction, and safety management know-how from a two-week course at a technician educational institution. During education training, KRW 20,000 per day and per person in training expenses were paid to the students.

c) Payment for Forest Workers

The wage of workers who participated in forest tending projects was KRW 25,000 per year and per person. Considering that the business districts were forests, workers received a total of KRW 33,000 per person, including KRW 8,000 for meals. If people worked 5 days continuously, the workers also would receive an additional wage for the day at a rate of KRW 33,000 per person (when working Monday to Friday with a paid leave on Saturday).

c. Achievement of Forest Gardening Projects

The total budget invested for forest gardening projects was KRW 54.7million. The project covered 40,044ha for forest gardening and 3,097ha for maintenance of urban forestry. Employed manpower totaled KRW 1,486,000 per year.

Table 3-13 | Achievement of Forest Gardening Projects in 1988

Classification	Annual Number of Employees (thousand people)		Budget Execution (million Won)		Volume of Projects (ha)			
					Forest Gardening		Urban Forest Maintenance	
	Plan	Result	Plan	Result	Plan	Result	Plan	Result
Total	1,300	1,486	54,894	54,761	34,700	40,044	2,850	3,097
National Forests	440	508	19,100	19,095	11,000	12,798	-	-
Private Forests	840	956	34,903	34,775	23,200	26,641	2,850	3,097
Private Organizations	20	22	891	891	500	605	-	-

Source: Korea Forest Service, Forest Resource Division.

d. Forest Development Effects

The forest project focused on specific forests, which were 11 to 30 years old. Thinning was conducted for coniferous forests, tending was implemented for natural forests, and mountain trail maintenance and forest cleanups were executed for suburban forests. Thinned trees from forest gardening projects were used as raw materials for fuel timber or sawdust. In the future, high-quality large-diameter logs will be produced, reaping more economic benefits from this project, in addition to the indirect benefits of carbon dioxide absorption and the improvement of watershed conservation functions.

The result of the cost/benefit ratio calculated for forest tending projects was about 2.5. In other words, for every KRW 10 billion invested, the benefit from using falling timber and the production of high value-added large-diameter logs would be KRW 14.2 billion. The benefit from the improvement in carbon storage capacity and watershed conservation functions would be KRW 10.5 billion, and the total benefit would be KRW 24.7 billion. If ecological and environmental functions, which were not applied to this analysis, are considered, the impact of the investment would be even higher.

e. Implications

According to the output of an on-site inspection for the forest tending project, this project was evaluated to be the best among public work projects, promoted by the government, in terms of productivity, public interest, and creation of employment.

Improvements to the project would include a long-term employment plan, and implementation not only for private forests, but also national forests. Better productivity and qualitative improvement of forest works can be expected with continuous employment of skilled workers. However, forestry works are commonly known as 3D jobs. Therefore, a comprehensive plan should be established to address and improve the risks, heavy labor, and poor work conditions of forest works in the effort to create employment and keep skilled workers gainfully employed.

2. Forest Mushroom Resources

2.1. Background and Need for the Oak Mushroom Income-generating Projects

2.1.1. History of Oak Mushroom Cultivation

The popularity of the oak mushroom dates back to Korea's monarchy era. This product also enjoys much demand throughout East Asia, including China and Japan, due to its excellent taste. The artificial cultivation process for this mushroom using the hardwood of oak trees dates back to the early days.

In Korea, artificial propagation tests were conducted for the first time in 1922 by the National Forest Research Institute. After the establishment of the Republic of Korea government, the institute succeeded in isolating the cultivation of pure culture spawns in 1955, distributed the spawn of oak mushroom to provinces in 1956, and provided technical assistance for production by grafting oak mushroom onto oak trees. In 1957, the government built facilities for starter cultures in the National Forestry Cooperatives Federation, the Special Forest Products Center (currently the Forest Mushroom Research Center), and began to distribute spawns nationwide. In 1967, the national forest research institute significantly contributed to the establishment of cultivation technology by integrating research results and presenting a study on the oak mushroom starter culture and cultivation.

The Special Forest Products Center developed a variety of spawns by selecting and cultivating superior species. Since 1981, the Korea Forest Research Institute has conducted full-scale studies on oak mushroom cultivation and species improvement and contributed

to the development of the oak mushroom industry by developing and distributing superior species.

Meanwhile, although sawdust cultivation research has been ongoing since the mid-1980s, it was not put to practical use due to bacteria spoilage and a low generation rate. In 1991, the first application of sawdust cultivation technology was distributed to forest owners.

2.1.2. Introduction Background

Convinced that oak mushroom cultivation could be a promising business that promotes economic development in rural and mountain villages and also important as an export resource for forest products, the Korean government (Ministry of Agriculture, Forestry and Fisheries) established a 5-Year Plan for oak mushroom propagation (1957~1961) from the 1950s after the liberation. At that time, the Center took full charge of the oak mushroom spawn culture business and began to supply spawns to rural and mountain villages in 1957, initiating the dried oak mushroom export to overseas market in 1959. As oak mushroom grew as an export industry, the second 5-Year Plan for oak mushroom propagation (1962~1967) was promoted as an industry that helped increase rural incomes and facilitate economic development. Since there were many broad-leaved trees and young trees, it was necessary to produce sawn timber which takes 30 to 40 years. However, it was also possible to use broad leaved trees for mushroom cultivation, turning over income more quickly.

Before 1974, there were no restrictions on oak mushroom production or export. However, from 1974, only the National Forestry Cooperatives Federation designated as a collector and supplier by the forest product use control and only the companies which had supply contracts and was recommended by the Federation could export. However, from 1983, it became possible for anyone to freely produce and collect oak mushrooms since it was removed from the list of forest product use control. Export restrictions were lifted as the mushroom became one of the earliest items to enjoy freer trade conditions.

In addition, the patterns of consumption in the market changed with the rapid growth of the national economy, and distribution of fresh oak mushroom sharply increased in the 1980s. The culture method changed from an outdoor natural culture to produce dried oak mushroom in rural and mountain villages to an artificial intensive culture to produce fresh oak mushroom in suburban farming households.

2.1.3. Process of Establishing Policy and Goals

In the 1960s, oak mushroom cultivation, which took place on a part-time or full-time basis in farming households, grew as an industry that significantly contributed to boosting incomes in rural and mountain villages and securing export resources. In 1970, the

government planned the expansion of oak cultivation, built collective production facilities and transformed the cultivation into corporative large-scale cultivation projects. To build such a cultivation complex, areas that grew stocks of broad leaved trees amounted to more than 10,000m^3, and areas where sustainable cultivation was possible were selected. One complex was large enough for grafting 50,000 trees over 500m^3, and small-scale cultivators were encouraged to move to a complex by organizing cooperatives.

The diameter measurement for stick cutting began in January and was finished by the end of February; and logging was completed by mid-March at the latest so that sticks could be supplied on time. The National Forestry Cooperatives Federation produced spawns by March 20, and all amounts of spawn were wholly provided to each cultivator by April 10. At the beginning, the government subsidized 50 percent (KRW 259) of spawn price to the National Forestry Cooperatives Federation, while the remaining cost came from local taxes or the cultivators themselves.

The grafting period was from the last ten days of March to the end of April at the latest, which is when the lowest temperature was 5°C and the highest temperature was around 20°C. The amount of grafted spawn was 1.6kg per stick of 1m^3. In addition, technical assistance was intensively provided to integrated cultivation areas, and guide managers were dispatched to each complex during the grafting period. With the aid of these diverse policy measures, oak mushroom cultivation was promoted in all parts of the country.

Oak mushroom cultivation began as one of the income-boosting projects of *Saemaul Undong* in 1974. In 1975, the rate of government subsidy for spawn was downward adjusted from 50% to 29%. Technical assistance was continuously provided, for example, the amount of grafted spawn increased from 1.6kg to 2.0kg per stick of 1m^3.

In 1983, oak mushroom was removed from the list of forest products of restricted use. Oak mushroom is a relatively high income-generating business for residents in rural and mountain villages as technical assistance and spawn production are provided and supported by Forestry Cooperatives, and the supply of sticks is supported by administrative organizations. In 1983, as oak mushroom exports became activated, prospective cultivators greatly increased compared to the previous year, sometimes pushing prices down due to overproduction.

A snapshot of the profitability of oak mushrooms includes gross income totaling about KRW 21,174,000 when the annual price of mushrooms was KRW 14,116 /kg, and the total production amount of dried oak mushroom was 1,500kg per stick 100m^3. As the total expense from the purchase of materials to the completion of cultivation was about KRW 10,439,000, net profit was KRW 10,735,000, which was about 50 percent of gross profit. The annual average income during the six years of cultivation was KRW 1,790,000 Won.

To protect oak mushroom cultivators, individuals or institutions that possessed some type of qualification or facility were required to register spawns with a government agency according to the Forest Law. The registered spawns were properly inspected by other designated agencies for sales and supply.

For financial support, a forest development fund (KRW 390 million) consisting of a one-year loan with a two-year grace period (5.5% interest rate) was provided. The beneficiaries of the loan were oak mushroom cultivators. Financial support and oak mushroom production facilities such as hot air dryers and storage facilities were provided. The maximum amount of the loan was KRW 3 million per household, and Forest Cooperatives were the designated agency.

2.2. Strategy and System for the Project

2.2.1. Strategies for Oak Cultivation

Until recently, oak cultivation has been developed as a major income source since the establishment of the government. The Korea Forest Service prepared comprehensive oak mushroom cultivation business promotion strategies in 1997 with action plans such as the development and distribution of superior species, stable supply for oak sticks, expansion of mushroom cultures on sawdust beds, modernization of cultivation facilities and establishment of cultivation complexes, improvement of marketing systems, development of processed food, fostering producer organizations, promoting export and enhancing import regulations, with an aim of "improving the system to establish a stable foundation for production, export and distribution in the oak mushroom business."

a. Development and Distribution of Superior Species

The research institute, facilities and budget have annually expanded for research work on spawns of oak mushroom. The spawn production system of forest mushroom research institutes under the National Forestry Cooperatives Federation was changed to a research and production system.

b. Stable Supply for Oak Log Sticks

Since the cultivation of oak mushrooms is influenced by the amount of oak log sticks, system improvements for a stable supply of oak log sticks were promoted. For this, the legal basis for "oak log stick production areas" was founded in the Forest Law. The Minister of the Korea Forest Service designated oak mushroom stick production areas at the request of forest owners in the case of private forests, and based on forest conditions in the case of national and public forests. In designated areas, cutting under reporting system was promoted for the continuous production of log sticks.

c. Expansion of Mushroom Cultures on Sawdust Beds

In order to distribute the technology of mushroom cultures on sawdust beds and increase production, the standard cultivation technology established through actual projects using cutting-edge cultivation methods was provided to farming households. With the specialized system and production complex, Forestry Cooperatives or spawn production companies professionally produced spawn beds and farming houses only focused on cultivation in order to promote productivity. In addition, in order to reduce production cost and increase competitiveness, the government encouraged modernization and scale improvement by reducing facility costs through financial support to sawdust bed culture and making production complex.

d. Modernization of Cultivation Facilities and Improvement of Marketing Systems

In order to improve productivity and competitiveness, financial support for protected cultivation was expanded to support 50 percent of oak mushroom cultivation areas. Year-round production systems based on protected cultivation balanced supply and demand for dried and fresh oak mushroom. Through the activation of joint sales by Forestry Cooperatives, a direct dealing system between producers and consumers was established, and stable prices and producer income were guaranteed by adjusting the time of shipment.

e. Export Promotion and Intensification of Import Management

In order to stabilize export amounts and infuse high value added to exported oak mushrooms, a specialized export complex was encouraged to directly connect production with export. In addition, financial support for packing and shipment of export items was significantly increased, and the development cost for packing and designs for increasing commercial value was supported. Furthermore, duties on imported products were adjusted to protect domestic farming houses and place–of-origin indication systems, which were intensified to prevent confusion between domestic and imported products, better protected producers and consumers.

2.2.2. Promotion System

While the National Forestry Cooperatives Federation took full charge of spawn cultivation and supply, technical assistance for cultivation, collection, joint sales and loans, the government played an integral role in policy and financial support. At the forest microorganism center (presently the forest mushroom research center), spawn production facilities were built to achieve superior spawn production. The facility contributes to boosting the income of oak mushroom producers by developing and providing high-quality oak mushroom spawns.

a. Cultivation and Supply of Oak Mushroom Spawns

After the development of pure spawns in 1956, the Special Forest Products Center began to cultivate and provide spawns for grafting in the autumn, from 1957. The oak mushroom cultivation business witnessed significant progress, and the cultivation system was also changed to collective cultivation. As the government subsidy ended in 1983, the spawn culture business of the Federation became self-sufficient in establishing a system for culture and supply. Since 1998, seven self-developed species were provided to 7,700 farming houses, helping to increase the income of rural and mountain villages.

b. Development of Oak Mushroom Species

After providing species separated from wild oak mushrooms and cultivated from 1957 to 1963 by region, species of different generating temperatures were developed through continuous development tests using various culture methods, resulting in psychrophilic, mesophilic and middle-high temperature species. Recently, as species protection system is introduced, priority is given to investment and R&D conducted to develop species of high quality since farming houses that use foreign species should pay royalty.

c. Production of Sawdust

As securing oak log sticks had become difficult since the late 1980s, the cultivation method for oak mushroom was changed from log stick cultivation to sawdust cultivation. Therefore, the National Forestry Cooperatives Federation decided to specialize in fresh oak mushroom production with sawdust cultivation in response to cheap Chinese products and built a oak mushroom sawdust cultivation center. This action helped to increase income and benefits for farming houses and save resources by producing and developing sawdust beds based on the Korean model and providing them to farming houses.

d. Training Oak Mushroom Cultivation Technology

In addition to personal assistance through visits to oak mushroom farming households, theoretical and practical training are also being provided at the request of farming houses and production organizations. Customized consulting services are also being provided to lead the effort in specialization of oak mushroom cultivation and nurture excellent farming houses by region.

For the distribution of oak mushroom cultivation technology, newsletters about tips for management by season and prevention of disease and pests are being sent to households while new textbooks for cultivation technology are also being distributed.

2.3. Details and Implementation Progress of the Project

With international trade barriers recently largely lifted, government support for oak mushroom cultivators have been expanded. To financially support oak mushroom cultivators, government loans and subsidies have increased. But a lack of public awareness has limited the cultivators' ability to take full advantage of these kinds of support.

The Korea Forest Service prepared implementation guidelines for agriculture and the forestry business in 2001. The guidelines aimed at improving the productivity and competitiveness of oak mushrooms, focusing on their ability to generate incomes for rural and mountain villages, by modernizing oak mushroom cultivation facilities and making them complex. In particular, the guidelines aimed to establish year-round production systems by turning outdoor cultivation practices into facility cultivation processes and developing an oak mushroom production base to facilitate the production of oak log sticks.

Figure 3-6 | Oak Mushroom Support Policy

Support Policy	Terms of Support
Mushroom Production Fund	Purchase expense of mushroom production with low rate loans – Ratio : government loan 70%, self 30% – Condition : annual interest 5.0%, repayment in 2 yrs with grace of 3 yrs
Mushroom Production Infrastructure	Production facilities (greenhouse, building, sprinker, etc.) – Ratio: gov. subsidy 20%, gov. loan 20%, local budget 20%, self 40% – Condition : annual interest 5.0%, repayment in 7 yrs with grace of 3 yrs
Production Equipment	Automatic drill for boring, etc. – Gov. loan 70%, self 30% – Condition : annual interest 4.0%, repayment in 7 yrs with grace of 3 yrs
Marketing Channel Improvement	Expansion of storage & drying facilities for stabilizing demand & supply, management fund for producer organizers

Source: Guidelines for Agriculture, Forestry and Fisheries, 2013. (reorganized).

2.3.1. Oak Mushroom Production and Export & Import Trends

a. Current State of Supply

Oak mushroom is one of the most representative mushrooms among forest mushrooms in Korea, and it is cultivated by more than 6,000 farming households. Oak mushrooms are short-term income resources with an annual production volume about 5M/T, total annual production amount around KRW 240 billion and the total export amount up to USD 5 million.The income per each household reaches up to 25 million Won.

Table 3-14 | Outputs of Oak Mushroom Production

Classification	Production Volume(kg)	
	Dried Mushroom	Law Mushroom
1955	5,539	
1965	72,414	
1975	455,613	
1985	880,000	
1990	1,648,447	
1995	2,824,381	
2000	2,278,008	17,454,440
2005	2,031,979	24,509,121
2010	2,741,521	20,806,347

Source: Statistical Yearbook of Forestry, Forestry Production Statistics, KOSIS, Agricultural, Forestry & Fisheries Survey.

A small amount of oak mushrooms began to be imported after the market opening in 1977, but the amount started to rise with the increase in domestic consumption after 1990. As of 2010, the import volume (dried mushroom basis) totaled 10,567 tons which is 2.8 times compared to 2005.

Oak mushroom is being imported mostly from China, which accounts for 99.8 percent (USD 24 million) of the total import amount, and USD 24 million in 2010.

Table 3-15 | Annual Import of Oak Mushroom

Classification	Quantity (M/T)	Value (1,000$)
1987	-	2
1990	333	524
1995	495	867
2000	1,139	2,738
2005	3,797	5,588
2010	10,567	24,148

Source: Korea Forest Service, Statistical Yearbook of Forestry.

b. Current State of Demand

Since dried oak mushroom worth USD 309,000 (84 tons) was exported in 1965, there was not much change in export volume until 1970. Until that time, the export amount steadily increased and reached USD 3,323,000 (332 tons). Afterwards, under the export promotion policy, exports increased up to USD 10,704,000 (696 tons) in 1980 and USD 23,258,000 (1,056 tons) in 1990.

More than half of all dried mushroom production had been exported until the late 1980s, but export volume has shown a declining tendency since the 1990s. This is because the price of fresh oak mushroom was high, and the market structure changed to focus on domestic consumption. Also, it was difficult to differentiate Korean mushrooms from cheaper oak mushrooms from China in the overseas market.

Table 3-16 | Annual Export of Oak Mushroom

Classification	Amount (M/T)	Value (1,000$)
1965	84	309
1970	180	738
1975	332	3,323
1980	696	10,704
1985	659	10,622
1990	1,056	23,258
1995	727	14,658
2000	228	5,012
2005	351	4,870
2010	313	5,225

Source: Statistical Yearbook of Forestry.

c. Price Trends

The price of dried mushrooms has shown a declining tendency. This is because domestic demand is changing from dried mushroom to fresh mushroom, and while export demand for dried mushroom decreased, competition with oak mushroom imported from China has deepened.

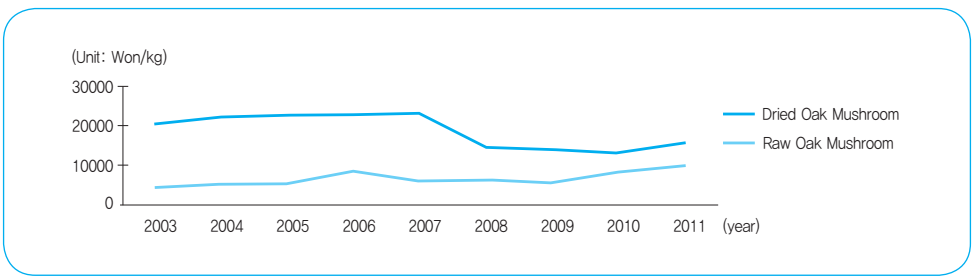
The real price of dried mushrooms of second quality in production areas increased from KRW 22,913 per 1kg in 2006 to KRW 23,017 in 2007. Prices fell to KRW 12,940 in 2010 but has been increasing since. The decline in the real price is due to a continuous increase

in domestic production. The increasing trend that has followed is attributable to the various ways dried mushrooms are steadily consumed.

The price of fresh mushroom is relatively stable with some fluctuation depending on the season. Prices increase in the winter and fall in warmer weather.

The annual price of fresh mushroom increased up to KRW 8,395 per 1kg in 2006, falling to KRW 5,622 in 2009, and then rising again to KRW 8,400 in 2010. Prices went up because production amounts decreased with worsening weather, and fresh oak mushroom imports decreased compared to last year due to high prices in the Chinese market.

Figure 3-7 | Annual Changes in Oak Mushroom Prices



Source: Statistical Yearbook of Forestry.

d. Actual Condition of Production (Cultivation)

In 2001, among the varieties of cultivated oak mushrooms, the low-temperature variety accounts for 62.4%, middle-temperature variety about 19.9%, and high-temperature variety 17.6%.

By region, the proportion of low temperature mushrooms is high in Chungcheongnam-do, Jeollanam-do and Gyeongsangbuk-do. The proportion of the middle–temperature variety is high in Gyeongi-do and Chungcheongbuk-do. In the case of the high-temperature variety, this proportion is relatively high in Gyeongi-do.

Table 3-17 | Main Items of Oak Mushroom (Facility) Cultivation by Region

(Unit: %)

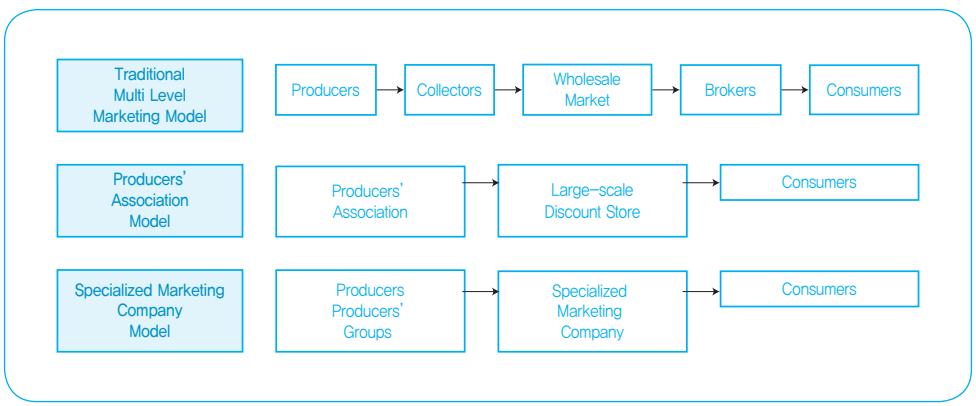
Classification	By Description			
	For Low Temperature	For Middle Temperature	For High Temperature	Total
Total	62.4	19.9	17.6	100.0
Gyeongi-do	19.0	47.6	33.3	100.0
Chungcheongbuk-do	29.4	70.6	0.0	100.0
Chungcheongnam-do	65.8	15.8	18.4	100.0
Jeollanam-do	81.7	8.5	9.8	100.0
Gyeongsangbuk-do	75.8	6.1	18.2	100.0

Source: 2011 Forestry Production Cost Statistics.

The above data was collected from 203 households cultivating more than 5,000 sticks.

e. Distribution System of Oak Mushroom

Figure 3-8 | Marketing System of Oak Mushroom



Source: 2013 training textbook for oak mushroom cultivation technology, 192p.

f. Income from Cultivation

In 2011, the production amount of households cultivating oak mushrooms (fresh oak mushroom basis) was 3,126kg per 10,000 sticks, the evaluation value was KRW 26,036, and income reached KRW 3,489,000. Compared to 2010, the evaluation value and income decreased by 4.5% and 22.6%, respectively.

Table 3-18 | Income from Oak Mushroom (Facility) Cultivation

Classification	2010	2011	Change	Rate of Change (%)
Appraised Value (A)	27,272	26,036	-1,236	-4.5
Production Cost (B)	31,532	30,792	-740	-2.3
Self-served Expenses	8,765	8,245	-520	-5.9
Management Cost	22,766	22,547	-219	-1.0
Income (A-B)	4,506	3,489	-1,017	-22.6
Production Amount (kg/10,000 sticks)	3,397	3,126	-271	-8.0

Source: 2011 Forestry Production Cost Statistics.

2.3.2. Oak Mushroom Cultivation Technique

a. Log Stick Cultivation

For log stick cultivation, spawn is grafted on the log of oak trees. Its cultivation is divided into outdoor cultivation and protected cultivation. Protected cultivation is again divided into summer, winter and year-round cultivation.

The period between the beginning of cultivation to harvest is about three to four years. Therefore, many factors such as the environment of the cultivation areas, the capital strength of cultivators, and labor force must be carefully considered.

Logging (around November) ⇒ natural drying of logs ⇒ hole drilling ⇒ spawn grafting (March) ⇒ temporary laying (piling up logs) ⇒ laying log sticks (May, June) ⇒ erecting mushroom necks (winter) ⇒ generation of mushrooms (watering, laying low) ⇒ growing and harvesting ⇒ selling

Figure 3-9 | Log Stick Cultivation of Oak Mushroom

Source: Korea Forest Research Institute.

Figure 3-10 | Sawdust Cultivation of Oak Mushroom

Source: Korea Forest Research Institute.

b. Sawdust Cultivation Technique

Sawdust cultivation is a cultivation method where spawns are grafted on the sawdust of oak trees mixed with rice bran or wheat bran powder to act as nutritional supplements. The proportion of sawdust cultivation is estimated at 95% in China and Taiwan, 80% in Japan and 25% in Korea. In the case of Korea, the proportion of sawdust cultivation is relatively low, but recently, the trend has been rapidly increasing by 20 percent over the past five years.

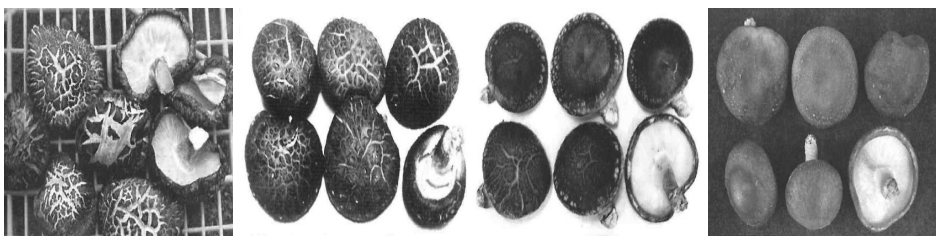
There is a type of production where cultivators directly produce oak mushrooms by purchasing spawns, as well as the type of cultivator that purchases complete culture beds and cultivated mushrooms. Producing sawdust beds personally requires a large amount of early-stage investment in facilities. Farming houses that plan large-scale cultivation projects are able to cultivate mushrooms with production facilities. However, for small-scale cultivation houses, it is convenient to purchase parceled culture beds and then cultivate them themselves.

2.3.3. Characteristics of Oak Mushroom Species

Oak mushrooms are divided into fresh and dried mushrooms by moisture content, outdoor cultivation mushrooms, protected film-house cultivation by production area, log stick cultivation, and sawdust cultivation by material. There are a total of 18 registered species: 10 species developed by the Korea Forest Research Institute before 2008, seven species developed by the National Forestry Cooperatives Federation and one type from the National Institute of Agricultural Science and Technology.

As Korea joined the International Union for the Protection of New Varieties of Plants (UPOV) in 2002, and as the oak mushroom became a protected variety in 2008, oak mushrooms were registered in the Korea Forest Seed and Variety Center according to the Variety Business Law while it was also registered according to the Forest Law.

Figure 3-11 | Varieties of Oak Mushroom



Sanrim No.3 (L) Sanrim No.8 (M) Sanrim No.9 (H) Sanrim No.10

Source: Korea Forest Research Institute.

2.4. Success and Limiting Factors

2.4.1. Case Study of Best Practices for Oak Mushroom Cultivation

<Case 1> One of the best ecological villages located in a mountain
(Seokhang-ri, Dongno-myeon, Mungyeong-si, Gyeongsangbuk-do, Korea)
Source: Mungyeong Newspaper, 7, March 2008

Seokhang-ri, a remote village in Baekdudaegan, was selected as an ecological village in a mountain in 2000 as part of the mountain village project supported by the Korea Forest service. About KRW 1.5 billion was supported to establish production facilities such as oak mushroom cultivation facilities and low temperature storage facilities. A living environment improvement project was also promoted, paving roads for villages and building convenient facilities for residents.

As a result, this village was a typical remote village in the mountain where 202 local residents lived and 99 households existed. At the time of project implementation, major income sources were chili pepper, garlic and other agricultural products. The annual income per farming household was KRW 13.8 million, but income per household increased by more than two times to KRW 28.6 million. Income sources are also diversified to high income-generating products: oak mushroom, pine mushroom, wild herbs and vegetables, schizandra and other products.

In particular, Seokhang-ri is located in an ideal area (600m altitude above sea level) for oak mushroom cultivation. As the income of farming houses increased when oak mushrooms of high quality were produced, and the market was easily founded through oak mushroom farming associations in Mungyeong-si, oak mushroom cultivating households increased from two households to 17 households, and cultivation facilities also increased by more than ten times from 14 to 150 facilities. In 2007, the annual net income was KRW 39 billion at its lowest, and KRW 135 million at its peak. Average income reached KRW 84 million, which is more than the income of a president running a small business. In Gyeongsangbuk-do, Seokhang-ri, Dongno-myeon, Mungyeong-si was selected as the best village during the "evaluation of the management of ecological villages in the mountains" conducted in 153 ecological mountain villages by the Korea Forest Service. About KRW 100 million was provided as a business expense, and the area was designated a "STAR ecological mountain village"

Gyeongsangbuk-do says it will continuously try to increase the income of local residents in Seokhang-ri by producing local specialties such as oak mushrooms and schizandra of a higher quality, as well as developing a mountain-specific program.

Figure 3-12 | Seokhang-ri, Mungyeong-si Oak Mushroom Cultivation Complex

Source: Mungyeongnews,2008.

<Case 2> Namsan-myeon, Chuncheon-si Farming House (Lee, Se-geun)
Source: Sanrim Ji, Nov. 2013

Lee Se-geun (age 62) in Namsan-myeon, Chuncheon-si, GangWon-do, is a forestry worker who has produced oak mushrooms on log sticks since the 1970s. He produces low-temperature oak mushrooms. Oak mushrooms begin to form in October and are produced until mid-November.

Mr. Lee has a farm and house in Namsan-myeon, Chuncheon-si, where cold wind blows, making it an ideal location for the cultivation of low-temperature oak mushrooms. He pays careful attention when putting mushroom spawn into oak trees since mushroom can be well generated when there is no germ. Putting spawns on margins of log sticks causes oak mushrooms to spread faster than other germs, which is an example of know-how accumulated through years of experience.

Besides watering, Mr. Lee does not use any materials and relies only on nature to grow his mushrooms. Instead, he put effort into making shades. Since he produces low-temperature mushrooms, making shades is important to produce mushrooms of good quality. He uses vinyl, which can block 70% of sun rays. The problem with using vinyl that blocks 100% of sun rays is that moisture cannot escape the film house. Mushrooms can have a good color when they are exposed to sun to some degree.

Oak mushrooms are collected and sold at the same time. All of them are sold by direct sales. They are delivered to nearby restaurants or sold to consumers through personal connections. At the early stage of mushroom cultivation, they are shipped to wholesale markets, but prices were too low compared to the effort required for oak mushroom production. Therefore, the focus was completely turned to direct sales. Income from oak mushroom sales reach an average of KRW 30 million annually. Mr. Lee is also doing various works such as rice farming or raising Korean cattle.

2.4.2. Limiting Factors in Oak Mushroom Cultivation[10]

a. Failure Cases of Cultivation

a) Poor Ventilation

Poor ventilation is caused by a cap that is poorly attached to a cultivation bag. If a film does not fit the cap, air ventilation narrows, making ventilation difficult. When making mushroom culture on beds after April, spawns grow faster at an early stage of its growth, and the amount of breathing enlarges as temperatures become warmer. Therefore, the risk

10. Failure Factors in Oak Mushroom Cultivation is extracted from "Current Trends in Oak and Pine Mushroom Cultivation" published by the Korea Forest Research Institute in 2004.

of ventilation becoming systematically deficient in cultivation bags with caps with paper type filters increases. In Japan, it is encouraged to use cultivation bags with filters or caps on the side.

b) High Temperature Injury

Injuries resulting from high temperatures are more common in the summer but can happens even before summer. While the oak mushroom spawn is growing, the amount of breathing increases, and a lot of heat is produced. In addition, if there is a large number of spawn cultures and rice bran powder is in a container, heat is generated and the temperature increases. In this case, cultivation is likely to fail due to high temperature injury at an early stage of cultivation.

However, high temperature injury happens overwhelmingly in the summer. In particular, there are many cases in which oak mushrooms are cultivated in greenhouses. In the case of pipe houses, the temperature of roof parts becomes quite high even if the side parts are open. Therefore, spawn culture beds in the upper part of the shelf are likely to be injured, and culture beds in the lower part remain in a normal state.

c) Excessive Cultivation

In early cultivation from December to February, if early growth is attempted through artificial heating so as to foster the growth of spawns, cultivation could progress too quickly, causing the culture beds to become fully mature. This leads to mushrooms being generated due to the cold shock in the rainy season in June. Passing through summer in this scenario causes intensive growth of mushrooms in the autumn. In order to prevent this, rough sawdust is used to restrain the decomposition, and culture beds are managed under low temperatures after spawns take root and grow.

d) Resoluble Water Injury

If culture beds are placed on the shelf and left alone, resoluble water is excreted, and culture beds may become partly weakened. If left unattended, mycelium absorbs the water and affects the energy of the mushrooms.

b. Failure Cases of Generation Management

a) Late Bag Cutting during Generation Management in the Autumn

It is important to cut bags ahead of the planned schedule since the generation time differs according to the climate every year and depending on the region. In the case of cutting bags after seeing the buds of mushrooms during the last ten days of September and the first ten days of October, the buds are deformed when they are pressed by the bags. Mushrooms grown from deformed buds drop in commercial value. In addition, it is likely that too many buds are intensively generated.

b) Delayed Harvest of Mushrooms

As mushrooms tend to be intensively generated in the fall, it is important to properly adjust the labor force. Otherwise, harvests could be delayed. If the first generation of mushrooms continuously progresses, the damage to the cultivation beds becomes severe, affecting the mushrooms more afterwards. To mitigate this impact, several ways of cutting the bags can be considered. It is necessary to concentrate on harvesting mushrooms, putting aside other works for the time being.

2.5. Implications for Developing Countries

2.5.1. Applicability of the Oak Mushroom Income-generating Business in Developing Countries

It is necessary to establish a unified system including production, marketing and processing to make oak mushrooms an income-earning business. Therefore, in developing countries, income can be successfully generated from oak mushroom cultivation by preparing and actively implementing the following comprehensive measures to foster the oak mushroom business.

a. Stable Supply for Log Sticks

One of the most important tasks to foster the oak mushroom business is to establish a stable supply system for log sticks. Producers have difficulty securing oak log sticks due to increased oak mushroom production. The problems caused by deteriorating conditions for oak tree cutting are more significant than an increase in demand for log sticks. Areas that have favorable cutting conditions have been utilized and turned to the wilderness, causing the increase in log stick prices and subsequent increase in production cost.

b. Expansion of Sawdust Cultivation

Sawdust cultivation needs to be expanded to maintain the stable balance between demand and supply for raw oak mushrooms. Although sawdust cultivation has disadvantages in that it requires higher initial costs to build facilities and high-technology, it has the advantage of saving oak tree resources. In addition, since its cultivation period is short, intensive cultivation is possible through sawdust cultivation, making it possible to overcome the limitations of log stick cultivation.

c. Modernization of Cultivation Facilities and Establishment of a Cultivation Complex

Small cultivation scales can be an obstacle to modernization and specialization, which are key points in promoting the oak mushroom business. The more serious problem is to design and build cultivation facilities without any "standard cultivation facility model," which is indispensable for modernizing cultivation facilities. In this case, it is necessary to minimize the damage from heavy snowfall, strong wind and other incidences.

d. Improvement of the Marketing System

In reality, the receivable ratio for producers is low as direct sales between producers and consumers had not been established. When the loss of producers is large in the marking process, for example, prices fall due to overabundant shipments during the active shipment period. Furthermore, since the principle of standard product size has not yet been established, excessive logistical expenses are incurred, weakening the competitiveness of producers and leading to consumer loss.

e. Development of Producer Organizations

Since it is difficult for producer organizations to play a central role in production, storage, processing and marketing solely through their farming association corporations, it is necessary to establish a comprehensive marketing system centering on a specialized association to improve the competitiveness of the oak mushroom business.

f. Policy Directions

A price stabilization policy including the government's purchase of reserve funds and support for facilities and processing technology development for products of low quality should be pursued. Moreover, financial and technical support should be expanded for the production and processing of superior oak mushrooms.

2.5.2. Matters to Consider for Policy Consultations

Research and development (R&D) for the oak mushroom business is emphasized to establish specialized cultivation techniques and improve productivity. Mushrooms that are suitable for the unique circumstances of each country need to be developed.

Mushroom cultivation techniques are divided into three techniques – the preparation of log sticks, spawns and the cultivation environment in terms of cultivation; cost, labor force, size of bed logs and usage of products (dried and raw oak mushroom) in terms of management technique; and sales (demand trends for produced items, marketing process, price trends, etc) in terms of marketing technique. Such technical measures should be taken to improve the profitability and cultivation of oak mushrooms.

Careful attention should be paid to using superior spawn since the selection and purchase of spawn itself is one of the cultivation techniques, and it directly affects the success and failure of cultivation management. Neglecting the purchase of spawn will lead to a failure in cultivation and thereby bring about the loss of resources which are valuable for the country as well as individuals.

The variety of oak mushrooms should be properly selected according to the conditions of the areas of cultivation, cultivation techniques, methods for management and purpose since the form and generation period of oak mushroom differ depending on the variety. During general cultivation and in the absence of any special purpose or facilities, it is desirable to select more than two varieties.

Although log sticks and superior spawn for cultivation are secured, it is difficult to mass-produce mushrooms of high quality without understanding the basic principles and techniques for cultivation. Therefore, to increase productivity per unit, first, it is necessary to understand the basic methods and techniques for cultivation and characteristics of oak mushrooms. Second, spawns that are suitable for local characteristics should be timely grafted. Third, equipment should be modernized. Fourth, rational management must take place by thoroughly managing cultivation.

3. Collectable Forest Resources

3.1. Background and Need for the Project

3.1.1. History of Collectable Forest Products

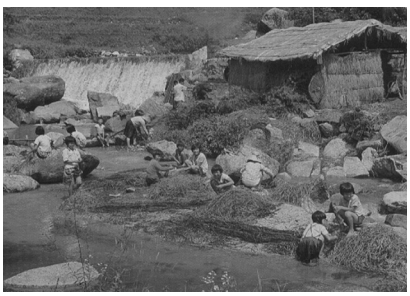
Forest exploitation, regardless of its size and range, has been one of the most traditional forest uses throughout the world given that forests possess all things necessary for living. In Korea, various kinds of collectable forest products such as fuels, wildlife and medicine herbs, vegetables, sap, and honey have been harvested from the forest.

Collectable forest products include oak bark, wild vegetables, medicine herbs, and local plants. Such items grow wild, not artificially cultivated so their harvest amount usually depends on natural and climatic conditions. Residents in rural and mountain areas have utilized these forest products as their source of income. Among the various kinds of forest products, wild herbs and vegetables, medical plants, oak bark, China root leaves, and oak tree leaves are items showing somewhat high amounts of yield.

Another major collectable forest product is fiber and textile, whose sub-items include arrowroot fiber, paper mulberry, bush clover and other kinds of fibers. Arrowroot fiber, a

unique fiber native to Korea, is not only utilized as an important raw material for producing wallpaper, but has also gained a considerable amount of foreign currency as a major export item. Paper mulberry, a raw material for Korean traditional paper, has been historically widely utilized to produce various kinds of Korean paper. The tree, however, suffered from a slight recession right after the end of the Japanese colonial era, falling behind with the development of the modern paper industry (FCF, 2002).

Figure 3-13 | Production of Arrow Root Fiber



Source: The National Forestry Cooperatives Federation.

Figure 3-14 | Repacking and Loading Oak Bark

Source: The National Forestry Cooperatives Federation.

It was from the 1970s that the organized system, where the Korea Forest Service played a key role for the production, collection and distribution of exploited collectable forest products, was established with the objective to increase exports as well as rural household incomes.

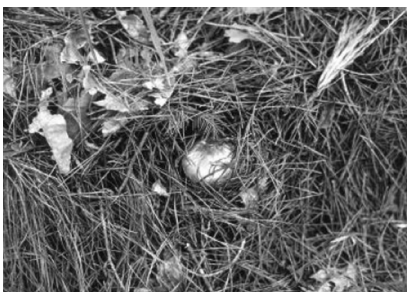
In the case of pine mushrooms called "Song-I," this variety had been marketed only for domestic consumption before 1969. But as the overall distribution system began to organize in 1970, pine mushroom production came under the set of procedures ranging from exploitation, selection, collection and to export. As a result, in 1973, the item of pine mushroom alone earned a considerable amount of foreign currency worth USD 3,000, exporting 176 tons out of 204 tons produced that year.

During the 1980s, the rural income gained from the margin of pine mushrooms increased by KRW 70,000 per kilogram/household, which was ten times higher than the value of beef. In general, there are mainly two species of pine mushroom. One is the "summer pine mushroom" that sprouts from the middle of July to early August, and the other is the "autumn pine mushroom" that sprouts from the end of August to the end of October.

Annually, about 600 – 1,000 tons of pine mushrooms were harvested and almost entirely exported to Japan, earning as much as USD 20 – 40 million.

In 1987, out of 657 tons of pine mushroom harvested, 566 tons were exported, earning approximately USD 40 million. In 1988, 800 tons of pine mushrooms were exported, earning about USD 42 million, reaching KRW 30 billion in non-farming income.

Figure 3-15 | Natural Pine Mushroom



Source: Jenonam Agricultural Research & Extension Services, 2002.

Figure 3-16 | Collection of Pine Mushroom

Source: The National Forestry Cooperatives Federation.

Diamyo oak leaves are another common collectable forest product widely spread out and found throughout the domestic mountains. Oak tree is domestically utilized in various ways – its timber and bark are for Tannin, and its nuts are for edible use. In addition, Diamyo oak leaves have been traditionally used in Japan to wrap a glutinous rice cake called "kashiwa mochi." It was in 1968 that the Sam-young trading company broke into Japanese markets and started to export these items.

At that time, the amount of annual consumption of Diamyo oak leaves in Japan was estimated at about 50,000 cartons, 20,000 – 40,000 of which were produced and exported from Korea. During the same period, Korea was also the top exporting nation of about 10,000 – 45,000 cartons of China root leaves, similarly used as Diamyo oak leaves.

In terms of production volume by year, 15,411C/T of Diamyo oak leaves were harvested in 1969 and 29,249C/T in 1987, while 2,702C/T of China root leaves were harvested in 1972 and 35,157C/T in 1987, recording USD 3.504 million in export earnings. The export volume of the two items continued to increase.[11]

11. C/T: Carton. The loading unit of package boxes that can be loaded in containers.

3.1.2. Objectives and Policy-making Procedures

Since the 1960s, the government has revised the legal institution so that strict law enforcement can be implemented around the entire distribution process of forest products ranging from harvesting, transporting and to lumbering. It was also part of efforts to address illegal activities surrounding forest products, secure a stable supply of exploited collectable forest products and expand incomes.

Article 16 of The Forest Law on the restriction of forest products and industrial forests provides the duties of the director of the Korea Forest Service. Specifically, if he or she deems it to be necessary for proper forest administration, the director may halt and regulate the production or utilization of forest fuels, wood and other forest products according to what the President prescribes. Also, Article 18 Clause 2 of the enforcement decree of the Forest Law states that the director of the Korea Forest Service should set up an annual supply and demand plan for forest resources including fuel-wood, bamboo and other forest products in accordance with the range of the basic forest plan. He or she may also halt and regulate the production, utilization and lumbering of major forest products by designating certain regions, customers and producers if he or she deems it to be necessary. Based on these articles, Korea Forest Service Announcement No. 31 was declared prescribing that the utilization of both arrowroot fiber and pine mushroom be regulated.

After 1970, when the regulation announcement on the utilization of forest products was declared for the first time, it has managed and improved the distribution circumstances of pertinent items through such means as designating producers and customers until 2006, which is when the implementation ended.

As the range of application of the regulation increasingly expands, the Forestry Cooperative played a wide role as both the producer and supplier in charge of a total of 13 items. Furthermore, the cooperative has streamlined and re-established the overall distribution system, taking full charge of all distribution processes of the designated items. However, reflecting the liberalizing trends in the international market, the designation was phased out once the system was successfully settled. Recently, only the marketing, production and use of pine mushrooms and pine needles are restricted (FCF, 2012).

3.2. Strategy and System for the Project

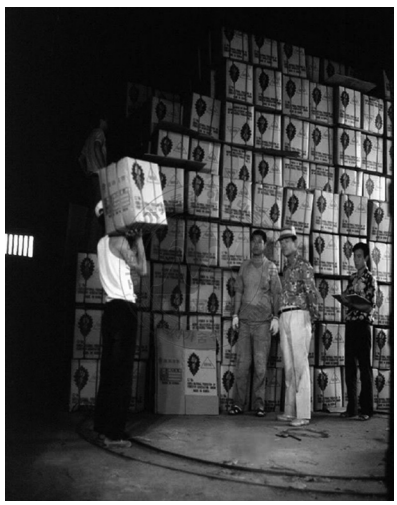
The government has actively promoted the identification and production of collectable forest products so as to serve as an additional source of rural income. To achieve this, the government provided institutional support by amending the relevant laws and rules to facilitate searching and harvesting collectable forest products. To this end, the government also empowered the Forestry Cooperative to supervise, instruct and guide a range of procedures including production, distribution and to processing.

Based on the relevant law, the Forestry Cooperative organization became the main agency in charge of every exploited collectable forest product. It may not only suggest the direction of relevant policies, but also regulate the utilization of major export items as well as other items necessary to control their supply and demand, helping to protect the interest of producers (KFS, 1997).

Figure 3-17 | Training Producers

Source: National Archives of Korea.

Figure 3-18 | Export of Forest Products



Source: National Archives of Korea.

The National Forestry Cooperatives Federation (NFCF) administered the overall harvest and collection of pine mushrooms, aiming to expand its members' incomes as well as export volume. The NFCF also established a set of procedures from harvest to export by contributing to the amendment of relevant articles in the forest law to allow for the entire quantity of harvested pine mushrooms to be exported. In addition, the presidents of the NFCF and local forestry cooperatives took charge of such affairs as guiding and promoting the production of pine mushroom; setting the volume of production; guaranteeing the right and interest of forestry members; releasing the area of their responsibility; and addressing illegal trading – all of which supported smooth implementation of the project.

Therefore, according to the relevant articles, anyone who harvested pine mushrooms, regardless of the amount, should take it to the nearest forestry cooperative or pine mushroom collecting point for guidance on how to sell it. If the producer sold the harvested pine

mushroom on his or her own without the consultation of the forest cooperative, such an action was a regulatory violation.

Diamyo oak leaves and China root leaves were items that were exported in their collected entirety, and exported only through the organizations related to the forestry cooperative. Those who exploited these items were prompted to achieve their targeted amounts with the goal of increasing income and earning foreign currencies.

Meanwhile, it is noted that in the past, Japan imported collectable forest products and industrial products mainly from Korea. However, in recent years, Japan has imported many Chinese products, resulting in a reduction in Korea's market share. Given this situation, the only measure for Korean producers to take was to generate products with superior quality for export. Otherwise, Korean collectable forest products could have lost their share in overseas markets, as well as opportunities for exporting other potential domestic natural resources. Every cooperative member recognized this impetus and concentrated on making superior goods for export (FCF, 2002).

3.3. Details and Implementation Progress of the Project

3.3.1. Supporting Policies on Exploited Collectable Forest Products

a. Production Plans by Items

The president of The National Forestry Cooperatives Federation (NFCF) determined the target amount per cooperative, set up production plans and provided direction to relevant local forestry cooperative directors. Then, based on the direction, local directors devised sub-plans for every forestry village community and signed a contract for production with the chief of each forestry village, based on the plans.

b. Training and Instruction for Producers

A series of training and instruction were provided tailored to rural residents so as to help them produce goods of great quality. At the same time, the local forestry cooperative director set aside certain forest areas for production – in order to secure sustainability of forests and natural resources – and obtained a permit to exploit forest resources from the mayor or governor of the pertinent district. Any members of the forestry community who wanted to participate in the production should acquire a certificate issued by the director, which should contain the approved person, period and collected item.

In terms of the production method, the NFCF recommended self-production methods to the community members. Those who were not able to self-produce were encouraged to take part in the community's joint business where the half-finished or completed goods

were made. In the case of pine mushrooms and squirrels, demand for which was rising as the most popular items for overseas markets at the time, these were exploited and captured one by one and by hand. The unit of the forestry community that collected these items cooperatively shipped and exported the items.

c. Joint Shipping of Forest Resources

Before the products were supplied to customers, they passed through several stages of gathering, processing, selection, examination, bidding, and storage – all of which were supervised by the Forestry Cooperative. The system of providing completed products to the market was largely divided into two parts – one was supplying to designated customers in accordance with the transfer instruction issued by the president of the NFCF, and the other was supplying to those who offered the highest price during the bidding at collecting points or joint markets.

d. Streamlined Production Phases

The distribution channel for forestry products was streamlined and unified, reducing the retail margin by strengthening the administrative authority of the Forestry Cooperative at individual collecting points. As the Forestry Cooperative took full responsibility for the overall production process nationwide, such a unified system facilitated focusing on achieving the planned target amount more easily, increasing each member's income with reduced retail margins, and boosting customer confidence in the quality of the goods.

3.3.2. Project Strategies by Item

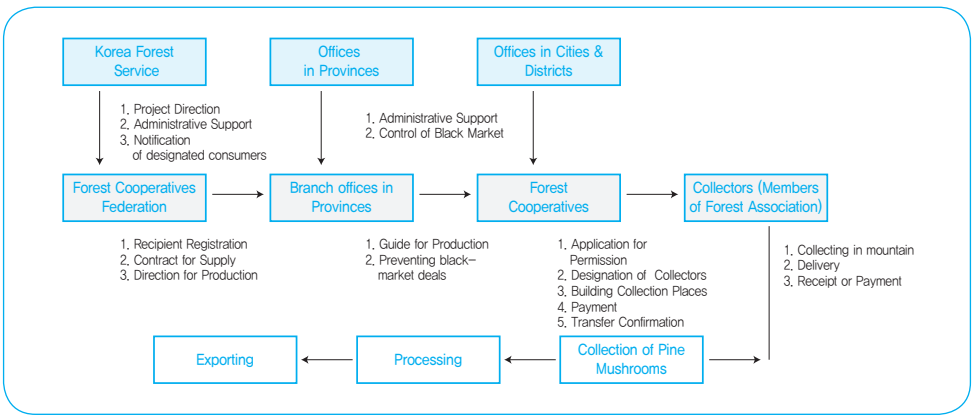
a. Pine Mushroom

Before the 1970s, there had been no restrictions on the production and export of pine mushrooms. Soon thereafter, however, the current system was created in which enterprises are allowed to export only with approved licenses or at the recommendation of the NFCF through a contract, as stipulated in the regulation announcement on the utilization of forest products.

Such a system aims to secure sustainable production by preventing illegal or over harvesting of pine mushrooms; to improve the quality of export goods by promoting harvesting pine mushrooms in accordance with strict standards and; to enhance rural incomes.

Meanwhile, every harvested pine mushroom was assembled at the NFCF, the organization fully charged with providing the product to export companies, through a competitive bidding process at a designated joint market. The NFCF even made use of international flights to secure rapid transport of the harvested pine mushroom to maintain freshness, a primary factor in determining market price (FCF, 2007).

Figure 3-19 | System for Collection of Pine Mushrooms



Source: The National Forestry Cooperatives Federation.

b. Diamyo Oak Leaves and China Root Leaves

China root (Smilax china) leaves, called "MeongGaeEep" in Korean, grow abundantly everywhere throughout the nation. The demand for China root leaves is especially high in Japan as the leaves have been traditionally used in Japan to wrap a glutinous rice cake called "Kashiwa Mochi." The leaf also infuses a fragrance and prevents the rice cake from going bad too quickly. Diamyo oak leaves are in demand in Japan for similar use. As both China root leaves and Diamyo oak leaves are harvested only for overseas consumption, it is necessary to produce goods of superior quality to sustain exports, which is the main reason why producers should continue to pursue higher quality goods (FCF, 2007).

3.3.3. Supply and Demand for Exploited Forest Products

The gross value of forest product exports in 1962 was USD 3.476 million. The export value of forest by-products, however, was only USD 503,000 earned from Shiitake mushrooms and arrowroot wallpaper. The gross value of forest product exports in 1980 remarkably increased to USD 62.9036, which was 180 times higher than that in 1962. Also, the value in 2000 recorded somewhat less at USD 28.1628 million.

As international trade became increasingly liberalized under the WTO, low-priced products from developing countries severely hindered South Korean exports from increasing, weakening the competitiveness of Korean products. However, domestic producers effectively counteracted the effects of liberalization with export strategies to develop higher-valued and new products using cutting-edge technology.

a. Pine Mushroom

The National Forestry Cooperatives Federation (NFCF) has been wholly responsible for gathering and supplying harvested pine mushrooms under the announced regulation on the utilization of forest products, including pine mushrooms. In 1970, when the project began, gross production was 189M/T, recording around USD 605,000 in total export sales and KRW 0.2 billion in rural income. However, export volume and value showed gradual improvement, becoming a major source of export earnings as well as a rural income driver.

The pine mushroom exported was primarily the fresh mushroom, but certain frozen and dried versions of the mushroom were also processed and exported.

Before 1995, more than 95% of output had been fully exported. Since 1996, however, this proportion fell to 60~70% of output, as domestic sales increased and restrictions on regulated utilization of forest products, including pine mushrooms, eased.

b. Diamyo Oak Leaves and China Root Leaves

It was 1968 when Korea began producing and directly exporting Diamyo oak leaves and China root leaves. In the case of Diamyo oak leaves, about 30,000 – 50,000 cantons (8,000 pieces per canton) were once exported per year, but their production is currently suspended as they have been replaced with low-priced Chinese products. In the case of China root leaves, about 40,000 – 50,000 cantons (3,500 pieces per canton) were once exported per year, but in 2001, only 2,568 cantons were exported as they lost price competitiveness with the low-priced Chinese products. The main reason for the poor sales results of domestic products is not quality but price.

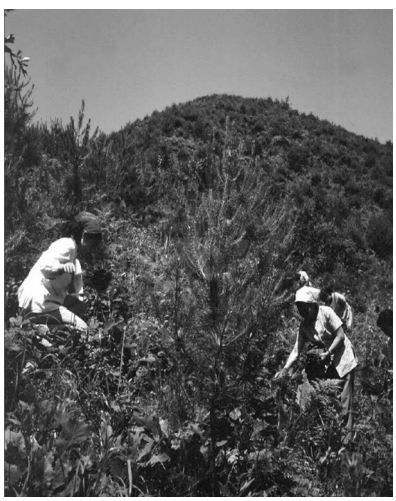
Figure 3-20 | Selection of China Root Leaves

Source: Kyungnamnews, 2013.

Figure 3-21 | Mangae Rice Cake with China Root Leaves

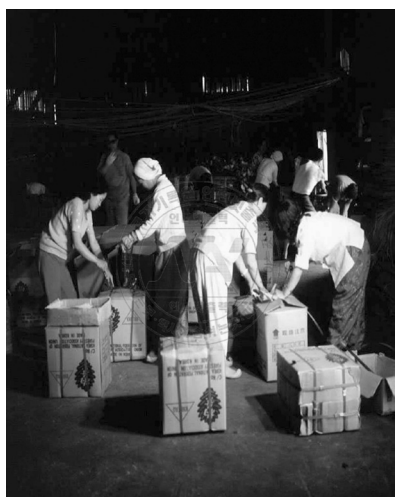
Source: Kyungnam internet news, 2011.

Figure 3-22 | Collecting Diamyo Oak Leaves



Source: National Archives of Korea.

Figure 3-23 | Packing Diamyo Oak Leaves for Export



Source: National Archives of Korea.

The annual amount of produced and exported Diamyo oak leaves and China root leaves increased from the 1970s and throughout the 1980s. After reaching its peak in 1986 with the highest volume of 52,313C/T, the production amount of China root leaves has since shown a decreasing trend.

In particular, Japan, the largest importer of Korean Diamyo oak leaves and China root leaves, increasingly imported more low-priced Chinese products than Korean products to meet national demands for the leaves. The price of Korean products continued to increase while the quality of goods remained the same, attesting to the urgency for Korean manufacturers to improve or differentiate their quality of goods, especially in the situation where demand in Japan for Diamyo oak leaves and China root leaves has been diminishing as consumption of rice cake has stagnated.

3.3.4. Challenges and Countermeasures

Exploited collectable forest products, regardless of the type, have largely contributed to improvements in the livelihood of rural communities as a major income source, as well as to industrial development as an important raw material, and to export earnings as a main export item.

Items specifically planned for bulk production to serve various uses are not items that anybody can just treat and trade. Therefore, a system for managing such production must be in place and should include several specific points:

1. Measures to address deforestation
2. Measures to maintain and promote scarce resources
3. Method for continuously maintaining the balance between supply and demand
4. Training and thorough administrative oversight toward standardization and quality improvement
5. Smooth supply process with no middlemen obstructing the distribution channel

To achieve such a system, it is necessary to establish a stable distribution system headed by an organization that enjoys high public confidence, and where the concepts of route sales and joint marketing are applied. In addition, well-established authorities should secure sustainable financing and facilities sufficient for conducting planned shipping and purchases. Subordinate organizations should enjoy a level of consensus that allows smooth operation of the system with some immunity against temporary or partial external influences or middlemen.

3.4. Case Study of Best Practices

3.4.1. Pine Mushroom

- Case: Village Forestry Association, Daeheung-li, Uljin-gun, Gyeongsang-Bukdo
- Source: April issue, 1981, Sanrim-ji National Forestry Cooperative Federation

The route sales system was implemented in 1976 where pine mushrooms, one of the major forest by-products, was made to be treated and traded through the forestry community. The chief of the forestry community at the time, Hong Sun-hwan (53), recognized the importance of discovering new sources of income in the forest to improve rural livelihoods as well as to support the sustainable production of known forest byproducts through forestation and conservation. To achieve this, he himself visited every household within the community more than three times per month to persuade residents that they should proactively control forest fires, emphasizing the necessity of such a precaution. Then the residents organized three observation teams with a village as one unit and covered a vast distance, amounting to more than 12 km per course, watching over forest fires for a whole year. This coordinated effort realized impressive results. During the monitoring period, there was not a single forest fire, which was a remarkable decrease in the number of trespassing climbers and; a notable increase in pine mushroom production.

In 1977, the village's annual gross proceeds of pine mushrooms reached a whopping KRW 30 million, returning more than KRW 0.4 million per household as an additional income. This was a very large figure in those days, and more than the annual gross earnings from farming. In the next year, however, the village's annual gross income from pine mushrooms was reduced by half to KRW 1.5 million, returning only about KRW 0.2 million per household as residents indiscriminately exploited pine mushrooms, including young sprouts, and failing to plan for the long-term.

In 1980, the village's annual gross output regained the level of the year before, recording 2.8M/T of the production amount. In addition, the village created a trust fund and started to put aside KRW 1.5 million annually. Fund reserves have since risen to the level of KRW 4.5 million. The fund served as a credit union where any resident in need could be provided a loan, and the proceeds of the lone rate went to pay a series of miscellaneous fees within the village.

3.4.2. Smilax China Leaves

- Case: Cheongyang-gun, Chungcheongnam-do
- Source: September issue, 1991, Forest Paper, Published by the National Forestry Cooperative Federation

Cheongyang-gun is the rural and mountain village located within the Chilgap mountain provincial park. Due to its physical geography and location, this village is especially abundant in forest by-products that can be utilized as a good income source such as oak leaves, Smilax china leaves, and shiitake mushrooms.

Oak leaves have nearly lost its place among income sources as its production amount has been gradually decreasing. The picking season for oak leaves usually overlaps with the busy farming season, including rice planting, and villages have been suffering from a severe shortage of workers with their aging populations. On the contrary, Smilax China leaves have played a key part in expanding rural incomes as their picking season is between June and July, which is after the busy farming season, making it easier to mobilize an idle production capacity. Also, Smilax China leaves grow abundantly throughout the mountains, so its production amount has continued to rise, recording around 10,000~13,000 cantons per year. The leaves also created several jobs for harvesting, processing and packaging.

It was the late 1970s that the Forestry Cooperative of Chungyang-gun started promoting Smilax China leaves as an industrial item. Ever since, Smilax China leaves have been a profitable item for additional rural income and export earnings as the processes needed for the production were simple and, compared to other products, production required less initial investment except for personnel expenses.

Rural residents numbering about 1,800 households, mainly non-working women, participated in the production of Smilax China leaves and contributed to a successful business. Smilax China leaves became one of the main items earning extra income exceeding KRW 2 million per household within three months of the project's launch. The Forestry Cooperative provided additional institutional support. It also designated Smilax China leaves as an official forest by-product item with great potential and gradually expanded the rate at which the item occupied several official business projects implemented by the cooperative.

For sustainable exports of Smilax China leaves, Forestry Cooperatives also provided training and instruction sessions. The cooperative had designated resident representatives who possessed leadership skills as well as substantial experience as a production instructor to visit rural producers every day and supervise the overall production process, including picking, harvesting, selecting and to packaging.

3.5. Implications for Developing Countries

3.5.1. Applicability of Industrializing Collectable Forest Products to Developing Countries

Industrialization of collectable forest products as a new income source can be a competitive alternative for developing countries since while exploiting the nation's abundant natural resources, forest products can have constructive benefits and are compatible with the current development trend of focusing on secondary and tertiary industries.

However, it is hard to make collectable forest products a new source of income with only a labor force. There should be sustainable support from both the national government and the public based on several preconditions. In particular, the government should lead the public to voluntarily participate in the production business intended to increase rural income. Also, production instructors deployed to the production site should provide rural residents with direct training and field practice to make sure the producing technology is disseminated effectively. Cooperation and the participation of rural residents are also essential factors for a successful production business. In this sense, the organized system should be established in close association with relevant administrative agencies and local groups such as neighborhood meetings to facilitate implementing each production procedure smoothly and seamlessly. Finally, a strict legal enforcement system should be constructed to ensure fair and unobstructed production and distribution.

3.5.2. Matters to Concern for Policy Consultation

As the kinds of wild Collectable forest products vary from countries and natural conditions, there would be no outstanding achievements made if the consulter nations just follow the same path of the South Korean case. Therefore, the research on the consulter nation's wild forest by-products should be conducted first to determine potentially competitive forest products. Remarkably increased rural income is likely to be expected if the determined products are then more properly classified and fostered into items for domestic consumption and for export income. So the selected products should be reflected in the policy-making process as a way to expand rural incomes. At the same time, constant promotion and education should be provided to the superior authorities including decision making body or forest-related association in advance, so as to help them recognize the necessity and importance of industrializing forest by-products. Nextly, the institutional support should underpin such an attention so that various forest byproducts can receive the government's sustainable support in various and official ways. The public will to participate in following the policy is also essential. With all these factors, the consulter nations should attempt to develop national forest by-products to be a newly competitive income source.

4. Forest Nuts & Fruit Resources

4.1. Objectives and Achievements of the Chestnut Income-generating Projects

4.1.1. Targets at the Initial Stage and Achievements

The Park Chung-hee regime was established in 1961 and initiated the 5-Year Plan for the Planting of Special-Purpose Trees (1968~1972), which included fruit bearing plants such as insect-resistant chestnut trees, so that chestnut trees and other plants could be spread throughout 30,000 hectares all over the country. The First 10-Year Forest Rehabilitation Plan (1973~1982) was focused on forest re-greening to restore forestlands at the earliest possible rate by planting fast growing trees and encouraging fruit bearing trees such as chestnuts and walnuts to increase the income of rural communities.

The first reforestation plan was initially targeted to plant 100 million hectares until 1982, but 106 million hectares of reforestation was completed four years ahead of schedule in 1978. As the chestnut tree was one of the 10 major species to be planted, the goal was set at planting 120 million trees in the area of 300,000 hectares.

Table 3-19 | Targets of Chestnut Planting during the First National Forest 10-Year Plan

Classification	Total		Area (1,000ha)				
	Area (1,000ha)	Number of Trees (million)	1973	1974	1975	1976	1977~88
Total	1,000	2,132	82	101	116	129	572
Fruit Bearing (chestnut)	300	120	12	18	25	30	215
Fast Growing & Fuel Wood	505	1,427	13	43	61	79	309
Long-term Growth Timber Trees	195	585	57	40	30	20	48

Source: Korea Forest Policy Society, 1975.

During this first planning period, the village reforestation project was one of the major activities, which was directly connected to the villagers' income. The target area of establishing a village chestnut forest was 75,000 hectares. Village nurseries and

reforestation activities were fully supported by the plan, and the earnings from the activities were reinvested in large portions to raise the incomes of the villagers. Village reforestation was implemented by priority – fruit bearing trees, followed by forming fuel wood forests, long-term timber plantations and pasture lands. Fruit bearing forests were first created in the surrounding areas of villages within 2 km in distance and a low slope land under 70% of the ridge height. The outer side of the fruit bearing forests was planted with fast growing trees and fuel wood species. The scale of chestnut plantations was on average 5 hectares from a minimum 2 hectares up to 10 hectares. Expenditures for chestnut seedlings and fertilizer transportation were fully granted, and even management costs were partially supported.

Over the first reforestation period, chestnut forests formed over 154,000 hectares with 61 million trees planted, constituting 51% of the goal achieved. Despite being behind in achieving its goal, it was President Park's strong leadership and ambition for the re-greening of national land, food security and income generation of rural communities that made possible the chestnut plantations, highly-motivated participation of the people and villagers, and funding from the central government.

The chestnut business peaked at 100,000 tons of nut production and USD 100 million in nut exports in 1990s. But since the mid-2000s, chestnut production has steadily decreased. The volume of nut production declined to 60,000~70,000 tons, and the volume and value of exports of chestnuts stabilized at around 15,000 tons and USD 30 million, respectively. To overcome this stagnation, the Korea Forest Service initiated chestnut cultivation as a core project to increase rural incomes through intensive management of chestnut orchards totaling 60,000 hectares, including tree shaping, and a lofty target of 90,000 tons of nut production and 30,000 tons of nut exports.

4.1.2. Contribution of the Project to Economic and Social Development

According to the data produced in 1975, per ha net profit of chestnuts was 1.6 times higher than that of rice production.

Table 3-20 | Profit Analysis of Chestnuts Compared to Rice in 1975

(Unit: Won/ha)

Item	Gross Profit	Management Cost	Production Cost	Income	Net Profit
Chestnut	297,000	69,000	83,000	228,000	214,000
Rice	333,000	82,000	200,000	251,000	133,000

Source: Korea Forest Policy Society, 1975.

Per village chestnut income reached KRW 1,445,000 over 5 hectares. As of 1975, since an 80kg bag of rice was priced at KRW 25,000, chestnut income was equivalent to 58 bags of rice. At that time, per capita GNP was KRW 290,000, which was equivalent to USD 607 (year 2005 base), and the average income of a farmhouse was KRW 872,933. In this regard, chestnut production could be considered having a significant impact on raising farmhouse incomes.

Table 3-21 | Per Village Chestnut Income (1975, 5ha)

Years	4	6	10	15	20	25	Annual average
Volume of chestnut production(kg)	750	3,000	8,750	15,000	8,750	5,300	7,305
Cost (1,000 Won)	30	40	45	45	50	50	48
Income (1,000 Won)	150	565	1,720	2,985	1,709	1,271	1,445

Source: Korea Forest Policy Society, 1975, cost except for self-labor and manure.

Forest by-products such as chestnuts and mushrooms contributed to the overall export industry, earning foreign currency. The volume and value of mushroom exports among forest by-products was the highest until the 1970s. Chestnut exports continuously increased from 1% of total forest by-product exports in 1970 to 30% in 1980, which amounted to 18,000 tons and USD 37 million, taking over the position of mushrooms. In 1988, chestnuts emerged as a promising item when the volume and value of chestnut exports reached 40,000 tons and USD 92 million, respectively, occupying 17% of total forest by-product exports. This was about 110 times that of 1975. Currently, the volume of chestnut exports has steadily decreased to a little more than 10,000 tons since the peak of exports at USD 140 million in 1994.

4.2. Background and Need for the Project

The Park Chung-hee regime changed the reforestation policy from mainly planting long-term timber species such as Japanese larch, Hinoki and Sugi in the 1960s to focusing more on fast growing trees and fruit bearing species in the 1970s. Saemaul reforestation and nurseries were expanded to 70% of fast growing trees and fruit bearing trees. The Saemaul nursery support fund, KRW 59 million, was distributed to the outstanding Saemaul Village Forest Cooperatives in a priority order through 70 city or county Forestry Cooperatives. In particular, President Park Chung-hee considered chestnut trees a substitute food and a way to address hunger in the rural areas and planted chestnut trees in the yard of the presidential

residence, the Blue House. He also detailed methods for watering and fertilizing the trees and sent his notes to the Secretary's Office for distribution.

President Park delivered the message that "as chestnuts are only grown in neighboring countries and some European countries like Italy, they are good for foreign markets and can contribute to food security, they protect forests and the price is more than 2.5 times that of rice. "Chestnuts serve 3 or 5 ends rather than 2 ends," he said during an inspection tour of Gyeongsangbuk-do in 1973. Accordingly, Minister of Kim Hyun-ok promoted planting chestnut trees, saying that "planting and growing one chestnut tree is great patriotism."

Taking this opportunity, chestnut planting was more encouraged as a core forest policy from the beginning of the 1970s, having the ability to recover denuded forests, secure food resources and earn short-term income. The chestnut tree reaped profits early, producing fruits after 4 to 5 years of planting, and early capital returns helped rural communities to raise income. Chestnut trees compared to other fruit trees did not require special cultivation techniques, and a relatively small number of chestnut trees planted in open idle land or abandoned farmland could help raise farmhouse income. Also, it was possible for farmers to cultivate chestnut trees using surplus labor by avoiding the busy farming season of growing other farm crops. This gave chestnuts a particular advantage since prices were relatively stable compared to other farm crops, and the timing could be adjusted to ensure that chestnuts were in the marketplace after a certain storage period. This allowed farmers to avoid the low price season, when most chestnuts were shipped to markets from late October to early December.

Chestnuts were used as a food source because they were more than 40% carbohydrate. Chestnut trees grew well all over the country because they are naturally distributed between 30 to 45 degrees of latitude as a temperate zone tree.

4.3. Strategy and System for the Project

4.3.1. Driving Entities and Operations of the Project

Saemaul Undong started in the early 1970s, initially focusing on improving the living environment. Later, it was expanded to raising rural incomes. Forest activity as one of the income raising projects was developed into a cooperative reforestation group such as the Saemaul nursery and Saemaul reforestation (planting fruit bearing trees). Forest activities under the Saemaul Undong were pursued in two ways – one in Saemaul forest greening and the other in Saemaul forest income boosting.

In order to disseminate the national plantation movement as part of Saemaul Undong and encourage private forest owners to join the reforestation activities by themselves,

President Park Chung-hee proposed the training of forest extension agents and publication of technical handbooks. In addition, publicity campaigns such as posters and mass media outlets like newspapers, radio and Daehahn news (which was the news before movies were introduced at the cinema) were actively promoted to encourage people to participate in tree planting activities.

Since the Korea Forest Service moved to the Ministry of Home Affairs from the Ministry of Agriculture and Forestry in 1973, the planting of fruit bearing trees was encouraged to increase rural incomes. The Fruit-bearing Trees Division was established under what was then the Forest Genetics Institute (currently known as the Korea Forest Research Institute) to develop new fruit trees like chestnut and walnut in 1974. Various strategies were set up to promote production and marketing of forest by-products, including chestnuts:

- Planned production through close technical assistance from the Forestry Cooperatives
- Expand production complexes and provide financial support for production cost
- Maximum production of superior quality products with timely cultivation and harvesting
- Produce value-added products through advanced processing

In preparation of an increase in production as a result of the expanded fruit bearing tree planting, it was necessary to set up sales and marketing processes to control the prices of forest by-products. Even though a large portion of product sales went to the merchants, the Forestry Cooperatives made efforts to protect producers and consumers by shipping some products through their systems. The National Forestry Cooperative Federation established the Forest Products Business Centre, a joint market, directly managed in Seoul in 1976 to keep chestnut prices stable, and to standardize the supply of chestnuts. It was the first initiative of its kind for direct sales and a joint market of forest by-products. The centre supported the export of forest by-products including chestnuts, the supply of products through contracts with a process manufacturer, and consignment sales for producers. These efforts by the National Forestry Cooperative Federation toward the chestnut marketing system in the form of production, collection, open sales, and processing for exports significantly contributed to increasing farmhouse income.

Table 3-22 | Gross Profit and Export by Chestnut Growers after Systemizing Business of the National Forestry Cooperatives Federation

Classification	1976	1980	1984	1988
Amount of Joint Sales (ton)	234	1,419	3,516	5,112
Supply Price (Won/kg)	401	940	805	864
Gross Revenue for Chestnut Growers (1,000 Won)	93,834	1,333,860	2,832,131	4,420,709
Value of Export (1,000 US$)	600	36,771	47,117	91,852

Source: Korea Forest Service, 1989.

The first of its kind, the Forest Products Market Place was instituted within the National Forestry Cooperative Federation with a national fund worth KRW 238 million in 1985. About 95 places were set up around the country with funds totaling 70% of the national fund and 30% self-provided from 1985 to 1996. From 1997 until 2000, 50% came from the national fund, 20% from local funds, and 30% was self-financing.

The Export Inspection Law was enacted in 1962, aimed at improving the quality of export products and creating a sound export environment via inspections of export items. Accordingly, an export inspection system for forest products was introduced the same year. Among the chestnut export items, fresh chestnuts and half-dried chestnuts from 1968 and canned chestnuts from 1985 were inspected to ensure product quality for exports. The inspection tasks were given to the Division of Inspection of the Forest Experiment Station (presently known as the Korea Forest Research Institute), and in 1985 were transferred to the National Forestry Cooperative Federation. The export inspection system for forest products was abolished on July 1, 1993, in the sense that forest product quality was deemed competitive enough for the international market.

Since 1974, the Forest Owners Convention was held annually at the province and county levels where forest owners, the Village Forestry Cooperatives and forest officers gathered. It was a venue for forest education, as well as the presentation of best practices in forest management and commendations for high-performing forest owners who contributed significantly to reforestation in the spirit of forest care. For the purpose of disseminating forest techniques for private forests, as of April 2012, a total of 880 agents were deployed at the Forest Cooperatives for extension services. In the 1980s, one extension agent was assigned to a chestnut farm of more than 5 hectares. From 2007, for the extension of locally specialized forest by-products, specialized technicians were selected from forest extension agents. Forty technicians were dispatched in 2007, and 20 in 2012 to city and county forestry cooperatives. The specialized technicians for each of the 14 short-term income

by-products including chestnuts provided farmers with cultivation techniques. Production and marketing information and club activities by product item enabled human networking to share useful information among the cultivators. A meeting for presenting best practices in extension services by specialized technicians has been held since 2007, expanding to general forest extension agents from 2009.

4.3.2. Financial Resources for Implementing the Project

Until 1966, financial resources for forest projects were in the form of government direct investment and subsidies. Reforestation expansion of fast growing species and fruit bearing trees was one of the eight major forest projects in the year 1973, which is the beginning of the First 10-Year Forest Rehabilitation Plan. In 1973, the government's estimated expenditure for major forest projects was KRW 6.8 billion. For the entire period of the first 10-year plan, the total estimated expenditure in forest plantation was KRW 77.5 billion, of which KRW 17.6 billion (22.7%) was invested in planting fruit bearing trees. The financial sources were national funds (26.6%), local government funds (2.1%), loans (12.2%) and self-financing (59.1%). A portion of self-financing for fruit bearing planting was higher than others at 75.5%.

Table 3-23 | Investment Value by Financial Source during the First National Forest 10-Year Plan

Projects	Investment Value (million Won)				
	Total	National Fund	Local Fund	Loan	Self-paid
Total	77,505	20,625 (26.6%)	1,642 (2.1%)	9,427 (12.2%)	45,811 (59.1%)
Fruit Bearing Trees (Chestnut)	17,622	935 (5.3%)	275 (1.5%)	3,112 (17.7%)	13,300 (75.5%)
Fast Growing Trees	13,666	4,982 (36.5%)	232 (1.7%)	2,422 (17.7%)	6,030 (44.1%)
Fuel Wood Forest	17,936	7,199 (40.1%)	-	490 (2.7%)	10,247 (57.1%)
Long-term Timber Trees	28,281	7,509 (26.6%)	1,135 (4.0%)	3,403 (12.0%)	16,234 (57.4%)

Source: Korea Forest Service, 1989.

There was no financial support system for forestry until 1966. In 1965, forestry financing was provided from one of the agricultural funds. As a part of the agricultural funds, the loan period was short-term, only 1 year, and the interest of 15-24% was still high even though it was lower than the general bank's loan rate of 25%. The first forestry purpose fund was

introduced in 1967 in the special accounts for financial operational funds so that the funds were made available in the mid-term for 13 years, payable in five years with an eight-year grace period at an annual interest of 9%, according to the plan of the Korea Forest Service.

With the limitation of funds, the loan was mainly short-term or mid-term, but the long-term nature of forestry required long-term funds. To overcome this problem, the forest development fund system mainly mobilized from the government budget was introduced in accordance with the Forest Development Law enacted in 1972 (later combined with the Forest Law in 1980). For the first time in 1973, the fund of KRW 500 million was raised by the government grant. The forest development fund, with low interest and long-term conditions, was targeted at mobilizing KRW 50 billion from 1973 until 1988. But the result was far less with only KRW 20 billion raised from the government grant of KRW 8.4 billion until 1982, interest revenue of KRW 2.3 billion and KRW 9.2 billion from the special accounts for financial operational funds until 1987. From 1988, forestry funds were transferred and managed by the special accounts for funds management under the Ministry of Treasury and divided into the forest development fund and the special fund for financial investment and loan. The special fund for financial investment and loan was absorbed into the agriculture and fishery development fund, suspending new loans.

In accordance with the Forest Law revised in 1990, revenue from the substitute afforestation cost, hunting fees and personal donation, were included in the forest development fund, totaling about KRW 31.7 billion until 1996. The loan conditions were, however, the same as the special fund for financial investment, and the interest rate was 5.5%. It was not suitable for long term forestry financing, and the system needed improvement by being more autonomous with a long-term and low interest rate, as well as expansion of the forest development fund.

The loan business of the forest development fund was handled by the National Agricultural Cooperative Federation from 1973 to 1980 and moved to the National Forestry Cooperative Federation from 1981. Loan conditions of the funds varied depending on the specific activity such as training chestnut tree experts and chestnut storage facilities.

Table 3-24 | Chestnut-related Loan Criteria for the Forest Development Fund (1973)

Projects	Project Unit Cost		Loan Period and Interest			Loan Eligibility
	Unit Cost (1,000Won)	Loan (70%) (1,000Won)	Grace Period (rate)	Pay Period (rate)	Total (years)	
Tending Chestnut Trees (ha)	40	28	10(3%)	5(6%)	15	Above 3ha
Storage of Chestnut Grafts (building)	1,500	1,050	5(3%)	5(6%)	10	Over 1 building
Chest Storage Facility (3.3m², pyeong)	90	63	5(3%)	5(6%)	10	Over 5 pyeong

Source: Korea Forest Policy Society, 1975.

With the enactment of the Forestry Promotion Law in 1997, the forest development fund was renamed the forestry promotion fund. But the fund has been transferred to and operated under the forest promotion account of the special accounts for agricultural and fishing village improvement since 2000.

With the enactment of the Agricultural and Fishing Village Development Law in 1987, the agricultural and fishing village development fund was created and supported the forest use development sector. It was suspended with the enactment of the Act on the Special Measures for Development of Agricultural and Fishing Villages in 1990. But the fund was recreated in 1992 with the revision of the Act on the Special Measures for the Development of Agricultural and Fishing Villages in 1991 and merged with the special accounts for agricultural and fishing village improvement.

The forestry fund under the special accounts for agricultural and fishing village improvement is managed in accordance with the operating procedures for forest project funds and regulated by Directive 1239 of the Korea Forest Service. There are two kinds of forestry funds. One is the national fund loan, and the other is the loan handled by the Forestry Cooperatives. The chestnut is being designated as one of the financial support items for forest income generation, and chestnut cultivation cooperative units of more than three farmers and producer associations are eligible for the support. Depending on the specific activity, financial conditions such as unit price and subsidy rate differ.

Table 3-25 | Types and Conditions of Subsidies and Loans for Chestnut Cultivation

Activities	Unit Price (1,000Won)	Proportion (%)				Loan (rate, grace/paying period)	Loan Unit Cost (1,000Won)
		National Fund	Local Fund	Loan	Self-paid		
Managing Old Chestnut Trees	1,292/ha	20	20	20	40	3%, 3/7	258.4/ha
Chestnut Pest Control Machine	12,000/unit	20	20	20	40	3%, 3/7	2,400/unit
Working Road for Chestnut Forests	5,000/km	20	20	20	40	3%, 5/5	1,000/km
Eco-friendly Chestnut Production	10,000/ha	20	20	20	40	3%, 3/7	2,000/ha
Chestnut Production Machines	Actual cost	20	20	20	40	3%, 3/7	20% of actual cost
Chestnut Pest Control Tower Vehicle	9,900/unit	-	-	90	10	3%, 3/7	8,910/unit
Eco-friendly Soil Improvement	504/ha	70	20	-	10	-	-

Source: the Forest Projects General Fund Working Guidelines in 2013.

To promote chestnut exports during the first and second forest rehabilitation planning periods, the Act on Agricultural and Fishery Marketing and Price Stability was enacted in 1976, integrating the past Agricultural Products Price Stability Fund Law of 1966. The export preparation fund for agriculture and fishery products was provided from 1977, evolving into the chestnut export promotion fund under the agricultural and fishery products price stability fund from 1981. The expenditure of KRW 428 million for export preparation of chestnuts was supported in 1977, and the cost of KRW 2,538 million for export promotion of chestnuts provided to chestnut export enterprises was an increase of six times.

Table 3-26 | Earmarked Amount vs. Expenditure of Chestnut Promotion Fund

(Unit: million Won)

Items	1977	1980	1981	1987
Total	(428) 571	(50) 1,714	(1,695) 2,000	(2,538) 3,000
Chestnut Export Preparation Fund	571	1,714	-	-
Chestnut Export Promotion Fund	-	-	2,000	3,000

Source: Korea Forest Service, 1989, the figures in bracket are expenditures.

The agricultural and fishery products price stability fund was also available for short term loans of within one year for chestnut collection and related activities. In accordance with the chestnut promotion policy, the fund for chestnut collection became increasingly popular from 1982. The funds were earmarked at KRW 3.7 billion in 1985, KRW 3.1 billion in 1986, and KRW 5.8 billion in 1987. The fishery fund was turned into the fishery development fund in 2004, and the agricultural products price stability fund has been managed by the Korea Agro-Fisheries & Food Trade Corporation since 2000.

4.4. Details and Implementation Progress of the Project

4.4.1. Major Supporting Policies for the Chestnut Industry

Extensive cultivation of chestnut trees can lead to more damage in the form of pests and diseases. Seedling planting activities degenerate the traits of chestnuts and sharply decreases chestnut production. Therefore, chestnut orchards require intensive care, and grafted trees derived from superior cultivars in terms of nut quality, high yield and insect resistance should be planted. For the propagation of superior chestnut trees, a stool bed is essential for supplying scions for grafting in that the unique characteristics are inherited.

When the chestnut gall wasp prevailed in Gyeonggi, Gangwon, Chungbuk and Chungnam, development of gall-wasp-resistant grafts was initiated, and efforts were made to disseminate the technology on a large scale. From the 1960s, the Forest Experiment Station (now the KFRI) selected 175 superior chestnut cultivars and finally released 11 cultivars for five years, performing provenance tests on 46 cultivars introduced from Japan. From 1963 to 1967, by establishing 10 hectares of chestnut variety orchards and 20 hectares of stool beds, 2.8 million chestnut grafted trees were disseminated. Also, the Forest Experiment Station in each province established a total of 190 hectares of stool beds between 1966 and 1970 and supplied 4 to 6 million chestnut grafts annually. Many

experiments on chestnut trees were performed, such as provenance tests by region, planting space tests, frost prevention tests and temporary storage methods to improve productivity. As a result, 60,000 to 70,000 tons of chestnuts were produced annually in the 1980s.

In 1964, to disseminate grafting methods for the chestnut tree, 40,000 scions were supplied all over the country, and members of the agriculture improvement club and 4-H club were trained via field exercises in grafting. However, the results showed a very low survival rate. The reasons were that two days of training were not enough to transfer techniques for grafting, continuous rains during the grafting period was not good for survival, and there were some problems in the packaging, transporting and storing of the scions. In the following year of 1965, 50,000 scions were grafted, and the survival rate was improved to 60% (Korea Forest Policy Society, 1975).

In this period, the chestnut nurse seed grafting method was developed, which made mass production of grafted seedlings possible. With the chestnut boom, many chestnut trees were planted, and the ensuing oversupplying of chestnuts and lack of exports, on some occasions, led to some abandonment of chestnut forests.

In the case of village nurseries for chestnut trees which began in 1973, the government promised loan support for the investment cost of KRW 245,000 for seeds, fertilizers, pesticides and other materials, establishing 500 pyeong (1 pyeong=3.3m^2) of village cooperative nursery land, and purchasing all 12,000 chestnut seedlings at the price of KRW 60.6 per seedling. Consequently, 30 farmhouses could earn a total of KRW 482,500, resulting in KRW 16,000 in nonfarm income per household if each farmhouse joined the cooperative work for only 20 days a year. In the case of establishing a village chestnut forest of 10 hectares, the government actively encouraged subsidizing the establishing cost of KRW 250,000. Over a period of six years, 6,000kg of chestnut harvesting would bring about KRW 1.2 million, which was a net profit of 940,000 per year. Each farmhouse would raise KRW 31,000 in nonfarm income (in 1973, 1 US$ was about KRW 399).

In the 1986 and 1987 typhoons, Vera and Dinah severely damaged chestnut farmhouses, and the government provided disaster compensation. Since 1988, if chestnut farms suffered losses because of natural disasters, government subsidies and compensation such as exemptions of school fees, extension of the payable period, an interest waiver for loans, and exemption of agricultural land tax were automatically provided according to Rule 143 of the Ministry of Agriculture, Forestry and Fishery.

Table 3-27 | Typhoon Damages and Aid to Chestnut Farm Households

Year	Amount of Damage (M/T)	Value of Damage (million Won)	Value of Government Aid (million Won)				
			Total	Exemption of School Fee	Relief of Victims	Loan Extension	Support Seedlings
Total	54,420	35,872	24,411	1,432	3	22,951	25
1986	25,334	16,226	14,181	454	3	13,724	-
1987	29,086	19,646	10,230	978	-	9,227	25

Source: Korea Forest Service, 1989.

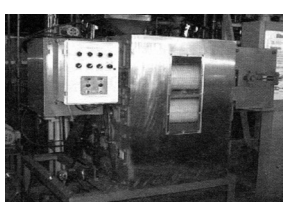
In the forest resources enhancement plan that started in 1988, major production sites for short-term income forest by-products were proposed to increase production and income from forest by-products. Chestnut production sites were designated in Hadong, Sancheong, Kwangyang and Buyeo in 1988, and as of 2012, a total of 20 sites were assigned – eight in Gyeongnam-do, six in Jeolla-do and six in Chungcheong-do. For the production sites, diverse benefits are given by the government in the following order: for collecting, storing, processing and marketing facility for chestnuts.

To increase the profitability of chestnut production, the process of collecting, storing and marketing chestnuts is more important than the production itself. In 1988, chestnut powder processing factories were set up in Hadong, Sancheong, Cheongwon and Gongju with a loan of KRW 464 million from the Korea Forest Service. In addition, four more chestnut processing factories were established until 1992 with the support of the KFS.

Figure 3-24 | Chestnut Collector

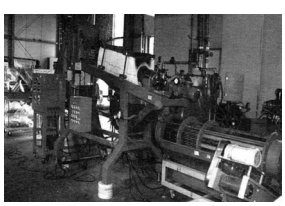
Source: Korea Forest Service, 2004.

Figure 3-25 | Peeling Machine of Chestnut's Outer Pericarp



Source: Korea Forest Service, 2004.

Figure 3-26 | Peeling Machine of Chestnut's Seed Coat



Source: Korea Forest Service, 2004.

In chestnut processing, the tedious job is peeling the pericarp. Breeding the chestnut cultivars that are easier to peel and developing effective peeling machines are high-priority requirements. The Chungju Forest Cooperative contributed to increasing the income of chestnut producers by setting up a chestnut processing factory that is able to produce peeled fresh chestnuts efficiently. The Cooperative also set up a chestnut storage facility that is able to adjust the timing of the shipping. In 2004, 66 facilities for chestnut storage were set up with a government investment of KRW 7.2 billion. Chestnut peeling factories numbered only two until 2004 and expanded to five in 2013. Chestnut harvesting occurs for about 40 to 50 days from late August to early October, produced from early ripening cultivars to late ripening cultivars. Due to the high dependence on labor for chestnut harvesting, 40% to 60% of total labor input for chestnut cultivation, developing a harvesting machine was critical.

To create demand for chestnuts, diverse products should be developed. Japan and Europe have been producing many items such as baked chestnuts, chestnut candy, marron glace, chestnut chocolate and chestnut jam to meet consumer demand. However, Korea depended on simple items like fresh chestnuts, peeled raw chestnuts and canned chestnuts, which have their limitations in adding value to chestnuts and expanding demand.

4.4.2. Chestnut Cultivars and Chestnut Supply and Demand

Chestnut trees as a shade intolerant species grow to just under 300 meters in height in climates that are not too cold, where eight-hours of sunlight is available, and winds are not too strong. Chestnut trees adapt well to Korea's climate and soil, and chestnuts have been used as a substitute food source because of its high starch content and nutritional value. Chestnut timber has been diversely used for furniture, civil projects, construction and sculptures because of its straight wood grain, density, and moisture tolerance. There was no concept of cultivars for native chestnut trees in Korea until the 1950s, and chestnuts were given local names like the Pyeongyang chestnut, Gapyeong chestnut and Yangju chestnut, based on where they grew. Chestnut seedlings raised from superior seeds were cultivated. In 1958, the chestnut gall wasp first appeared in Jecheon of Chungbuk and spread rapidly all over the country, causing severe damage to native chestnut trees.

From 1961, insect resistant cultivars among native chestnut trees were selected. Until 1967, 13 cultivars including Okkwang were released. Prevailing chestnut cultivars in Korea were introduced from Japan such as the Ginyose, Tsukuba, Arima and Riheiguriand, occupying about 70% of the total cultivating areas. Some domestically bred cultivars released by the Korea Forest Research Institute include Okkwang, Daebo, Kwangeun and Bakmi 3. The Daebo has been widely expanded since 2000. In particular, Okkwang and Riheiguri, due to their superior shape and quality, have been branded and sold at more than a 20% higher price than others (Kim, Man Jo. 2007).

Meanwhile, experimental studies were also carried out to improve the productivity of chestnut forests, such as high grafting methods and a low tree-form training system. Such studies also benefited fruit quality, resulting in a quantity increase, as well as mechanization of orchard management so as to raise growers' income.

However, the development of new cultivars is still necessary to meet the demands of producers and consumers. From the aspects of cultivation, if the nuts are large and naturally fall after ripening, the labor cost for harvesting could be less, and cultivars of high stability such as early ripening, less alternate fruit bearing and resistant to pests and diseases are also beneficial. In terms of consumption, raw chestnuts should have the traits of high sweetness, good flavor, kernel hardness, good taste and high storage quality, and roasted or processed chestnuts should be easier to peel and possess good flavor. Even though test guidelines for chestnut traits differ by country, Korea uses the guidelines developed by the KFRI and provides producers and consumers with identified traits of chestnut cultivars for efficient use. Daebo, among the cultivars grown in Korea, has high facility peeling of 86.4%.

New chestnut cultivars are derived by combining the superior characteristics of cultivars by crossing and going through the process of selection of parent trees, hybridization, progeny test, adaptability test and dissemination. Likewise, Chestnut breeding usually requires a long period of 20 years, but this could be shortened to about 15 years through high grafting methods by cutting scions from 1-year hybridized seedlings and grafting them to rootstock to induce early buds and fruit bearing.

Chestnut production has steadily increased since the 1970s until it peaked in 1997. Due to the aging chestnut forest, production quantity has slowed since 2000. Chestnut trees were mainly planted from 1973 to 1987, occupying 76% of the total chestnut forests aged over 30 years old. The ages of maturity are 10 and 15 years, declining productivity occurs at 20 and 30 years, and old age is considered 30 and 40 years for grafted trees and seedlings grown from seeds, respectively.

Chestnut production sites in Korea include Hapcheon, Hadong and Sancheong of Gyeongnam, Imsil, Kwangyang and Suncheon of Jeonnam, and Buyeo, Gongju and Cheongyang of Chungnam and Chungju of Chungbuk, and the chestnut cultivated areas under Jeonnam and Gyeongnam occupy 62% of total cultivated areas.

The trend in chestnut production showed that the annual volume of chestnut production was less than 1,000 tons until 1964. However, production grew from the 1970s, and volume increased to 10,000 tons in 1975, 43,000 tons in 1980, 72,000 in 1985, and 93,000 tons in 1995. The peak yield was 130,000 in 1997. Since then, production slowly decreased, stabilizing at 60,000 to 70,000 tons per year after 2010.

Table 3-28 | Volume of Chestnut Production

(Unit: kg)

Year	1960	1965	1970	1975	1980	1985
Volume	871,764	1,310,190	3,037,286	10,019,598	42,826,337	72,000,000
Year	**1990**	**1995**	**1997**	**2000**	**2005**	**2010**
Volume	85,043,279	93,654,527	129,672,521	92,844,415	76,446,957	68,630,073

Source: Korea Forest Service, Statistical Yearbook of Forestry.

The global production volume of chestnuts increased 12.1% in annual average from 938,000 tons in 2001 to 1,959,000 tons in 2010. China is the world's biggest producer of chestnuts, occupying 75%, followed by Korea (6%), Turkey (6%) and Italy (5%).

Around 2010, about 20% of the volume of chestnut production in Korea was exported, and the rest was used domestically. For the export, chestnuts were mostly purchased by the Agriculture Cooperatives (80%) and Producers Associations (15%), while, according to the survey in 2011, domestic chestnuts were sold to the Agriculture Cooperatives (47%), direct marketing (28%) and middle man (19%). On-site marketing centers established through government support, the use of the internet and the experience of farming operations increased direst sales to consumers.

Chestnut exports was merely 586 tons (USD 839,000) in 1975, increasing to 17,000 tons (USD 36 million) in 1980. In 1988, 40,000 tons were exported, valued at about USD 92 million. This constituted about 17% of the total export value of forest by-products and approximately a 110 time increase compared to that of 1975. Chestnuts emerged as a promising item for export. After the peak export value of USD 140 million in 1994, exports gradually decreased and remained at little more than 10,000 tons in volume. In terms of value, however, chestnut exports have held the largest portion of the total export value of forest by-products since 1980. Most chestnut exports went to Japan, followed by China until 2002. Afterward, China became the biggest importer of Korean chestnuts.

Chestnut export values in 1976 and 1987 consisted of 55.2% and 8.6% of canned chestnuts at USD 463,000 and USD 7,223,000, 29.9% and 90% of peeled fresh chestnuts at USD 251,000 and USD 75,550,000, 13.4% and 1.4% of fresh chestnuts at USD 112,000 and USD 1,165,000, and 1.9% and 0.02% of half-dried chestnuts at USD 13,000 and USD 19,000, respectively. Until 1975, the main export items were fresh chestnuts and canned chestnuts. But from 1976, peeled fresh chestnuts have been mainly exported. Value added chestnut products should be developed and diversified to expand exports.

Table 3-29 | Volume of Chestnut Exports

Classification	1975	1980	1988	1990	2000	2010
Volume (M/T)	586	17,798	40,015	36,471	15,615	13,185
Value (1,000$)	839	36,771	91,852	94,279	89,044	30,157

Source: Korea Forest Service, Statistical Yearbook of Forestry.

4.5. Success and Limiting Factors

4.5.1 Success Factors and Best Practice[12]

The first success factor was the strong leadership of the then Korean president Park Jung-hee. President Park established medium to long-term plans for economic development and forest conservation and greening. To put these policies into action, he demonstrated leadership and encouraged people in various ways such as handwritten notes, sign boards, statements, rewards, and site visits. He also experienced success and problems through the Saemaul Movement (new village movement). At the briefing sessions of monthly economic trends hosted by the Economic Planning Board, leaders of the Saemaul movement presented their successful cases and were awarded medals as encouragement.

The second success factor was the formation of a social consensus. The catchphrase "Let's be better off" led to the voluntary participation and support of the people.

The third success factor was the strengthening of the government system by keeping the Korea Forest Service within the Ministry of Home Affairs, setting up an enforcement agency for the Saemaul movement, and creating an institutional framework for cooperation between the related government agencies - all under the President's leadership. Establishment of the administrative institutional framework ensured that the president's leadership did not end merely as a personal wish but continued as a system where leadership could be continuously applied by creating an environment where elaborate plans and achievements were encouraged. Also, government employees and people voluntarily participated and cooperated as a result of the social consensus for a successful operation.

The fourth factor was women's participation in the social activity. The Journal "Forest," published by the National Forestry Cooperatives Federation since 1965, and the "Saemaul," published by the National Council of the Saemaul Movement since 1974, introduced a number of exemplary nursery and Saemaul cases. In the nursery business, women who carried a baby

12. The content of success factors and best practices is selected from The Korean Association for Public Administration (2009) and reorganized.

on their backs were paid the same wages, and women who were more skilled in dry field farming received preferential treatment for seed collecting and sapling cultivation.

The fifth factor was to induce voluntary competition among villages. Some 21,000 self reliant villages were supported through the wage business, production improvement projects, income centered businesses, and grants worth more than KRW 1 million. Among these, the income centered business allocated wages in such areas as village afforestation and the nursery business, and these operations fell under the jurisdiction of the Ministry of Home Affairs and Korea Forest Service. The village afforestation and nursery business were not open to every village – but only to those that showed good progress in the Saemaul movement. Therefore, voluntary competition was induced by giving credit to outstanding villages in various ways such as a presidential stipend, commendations, and the granting of good seedlings in support of the village's joint project based on performance.

The sixth success factor was the creation of jobs for food, clothing and shelter. Forest conservation and the greening business were paid positions. Although the wage was quite low as men received KRW 1,000 and women received KRW 600, at a minimum, people were no longer hungry. However, in many cases, people were paid in kind with items like flour and milk powder. Also, one of the few sources of income in the farm village was related to tree planting such as carrying seedlings and fertilizers and planting the seedlings.

□ Best Farm Practices

<Case 1>

Title: Raise Good Money from Forest, Chestnut Orchards; and Make my Dream Come True

Gyeongnam Hapchenn-gun, Jeon Yong-won

Source: Forest (November 2013) by the National Forestry Cooperatives Federation, text and pictures by Lee Seunghwan (reporter from Nong-rim news)

Jeon Yong-won, President of the Chestnut Forest Community in Hapcheon, Kyeongnam, devoted his whole life to growing chestnut trees in his hometown. Mr. Jeon cultivated about 3,200 chestnut trees over 79,200m^2 (24,000pyeong) of forest land and emphasized that, "The traits of trees and good farm management can result in high quality chestnuts." As he is also interested in superior cultivars development, he picked out several cultivars that are big in size and pest-resistant.

Mr. Jeon, selling an yearly output of 14-15 tons through the Samga Agricultural Cooperatives, says proudly, "Although I cultivate 8000 pyeong of rice crop and raise 12 Korean native cows, I feel most comfortable and motivated when I work in the chestnut orchard."

'Priceless treasure I found' says a proud Mr. Jeon, posing in front of superior species.

The future is bright if chestnuts are well managed and controlled from pests and large enough for marketability.

Source: Forest (November 2013) by the National Forestry Cooperatives Federation, text and pictures by Lee Seunghwan (reporter from Nong-rim news).

For over 40 years, chestnut trees were mainly Japanese cultivars like Tanzawa, Tsukuba, Ginyose and Riheiguri. A considerable number of Daebo, domestically improved cultivars that are highly marketable and disease resistant, have since been planted. Tanzawa, early ripening chestnuts, are suitable for roasting. Riheiguri, early-medium ripening cultivars, has the feature that when peeled, the inner skin is removed at the same time. Meanwhile, Tsukuba, Ginyose, Daebo, and medium or medium late ripening cultivars, are marketable due to their large size and good storability.

Mr. Jeon's chestnut farming begins as he prunes after harvesting in late fall. From late October to November, he clears up non-bearing tillers, closely grown branches and other obstructive branches. In the spring, he fully focuses on compost work. In March, pig or fowl dropping compost is scattered once every two-three years, and 1 bag (20kg) of BB compost (chestnut compost) is added per every 15 tree each year. Around August 15, when weeds are at their weakest, weed mowing takes place for about one week. As this is right before harvesting early ripening chestnuts, it is much easier to gather chestnuts when the weed mowing is complete. Around August 20, early ripening Tanzawa is picked first. At this point, he hires at least three to as many as 10 people to collect chestnuts. September 20~27 is the peak season when each worker collects 120kg of chestnuts per day.

According to Mr. Jeon, pruning and weeding are the most important work in a year. Proper pruning allows the field to be well-lighted and ventilated, resulting in large size chestnuts. Suitable pruning for a 15-year-old tree, which is normally the most productive age, is to have about 250 burs. Weeding is necessary work for not only the quality improvement of chestnuts, but also soil conservation. With pruning before harvest, chestnuts are prevented from being scratched when they fall. Later, it decays and becomes excellent compost.

Pest control is another important task to pay extra attention to in chestnut farming. Mr. Jeon, as president of the Chestnut Forest Community, requested the county office to conduct airplane dusting and spraying throughout the entire Hapcheon-gun area. Now, airplane dusting and spraying is conducted once a year, which he is trying to increase to twice a year, to completely control pests. "There are two main insects that damage chestnuts. Dichocrocis punctiferalis, which damage and make chestnuts rot when the burrs are just beginning to form in the early summer; and chestnut curculio, which hatches eggs in the holes it makes in the chestnuts during the harvesting season. The most effective pest control periods are June for the *dichocrocis punctiferalis*, and August for the chestnut curculio. So I am requesting cooperation from the forest department to perform pest control twice a year."

Mr. Jeon also has a talent for selecting and growing superior seedlings in addition to chestnut production. For over 30 years, whenever he hears of a superior cultivar in Hadong, Uiryeong, Sanchung, or Hamyang, he goes there to take the budwoods and make grafted seedlings. The test cultivations have resulted in hundreds of seedlings.

Difficulties in chestnut farming are shortage of labor and rising wages. There is no viable alternative for the exodus of people from agriculture and aging rural areas. To solve these problems, Mr. Jeon emphasizes the importance of pruning. Although pruning may slightly reduce production, it results in larger and higher quality chestnuts that have much greater profitability. It also makes farm work easier, leading to reduced cost.

Mr. Jeon has served as president of the Hapcheon-gun Chestnut Forestry since autumn of 2008 and achieved good results for over 1700 farm members. He obtained administration support for pesticide spray and soil improvement, and introduced and extended advanced technology with strong ties to the Forestry Cooperative. He is further planning to raise funds through membership fees for sending members on study tours to advance their knowledge of areas and develop new markets.

The remaining task as president is to renew species of trees in the entire region. Hapcheon chestnuts are sweet, well-ripened and good in storability, but they also have low output due to the old age of the species. It is Mr. Jeon's dream to boost Hapcheon's chestnut industry with excellent species, including superior species that he selected.

<Case 2>

Title: Dr. Chestnut that Revamped Cultivation Techniques and Distribution Methods
Chungnam Buyeo-gun, Lee Gun-Hoon (Received Presidential Citation in 1989)
Source: Success case recognized as a man of merit by the Korea Forest Service, 1995

□ Management Area: 140ha (Owned: 70ha, Leased: 70ha)

□ Afforestation Area

Classification	Year	Area	Number of Trees	Remarks
Total		140ha	50,000	
Chestnut Trees	1963~1968	70	28,000	
Others	1984~1987	70	22,000	Walnuts, Apples, Chestnuts

□ Business Outcome

Classification	Year	Profit	
		Quantity	Value
Chestnut	1994	250,000kg	250 million Won

Esteemed Forest Manager Gunhoon Lee decided to engage in forestry after completing his military service to follow in his father's footsteps. Approximately 70ha of forest land is located at Mountain 32, Hyunam-ri, Guryong-myeon, Buyeo-gun. Chestnut trees were chosen for his business as they were highly adaptable to Korean climate conditions. They were also nutritious, which made them not only a favorite food, but also an alternative food resource. Lee achieved initial success by harvesting 30 million tons of chestnuts in

1969. However, shortly after his success, the harmful insect Dryocosmus kuriphylus that first appeared in 1958 and continuously damaged Korean chestnut forests spread to Lee's chestnut forest. Lee had to cut down all of his chestnut trees in 1970.

Lee did not give up on the business and applied to his chestnut trees a new graft technology (high-grafting) developed in advanced countries. However, he soon faced financial difficulties. Fortunately, close families and friends who were well aware of Lee's diligence and personality began to support him, which enabled him to perform thinning, pruning and weed scraping on time to prevent chestnut trees from being negatively impacted by natural obstacles that could hinder their growth and fruitfulness. He was then able to realize increased productivity and stability in harvesting large volumes of high quality chestnuts.

Five years later, a new variety of chestnuts was produced exponentially. Due to such a significant volume supplied to the market, the price had plummeted. Furthermore, the unsold chestnuts spoiled, exacerbating the loss and difficulties. At this point, Lee determined that the essence of the chestnut cultivation business of minimized cost and maximized profits was in the ability to preserve chestnuts and maintain good quality. He acquired the proper preservation techniques by studying post production management and fruit management. In 1978, he built 120 pyeong (400m^2) of low temperature storage sheds in Gubong-ri, Guryong-myeon.

As a result of the effort to preserve good quality chestnuts, Lee managed to generate large volumes in sales during the off-season. In addition, Lee purchased 70ha of more mountain land in Chunghwa-myeon, where he planted not only chestnut trees, but also walnut and apple trees. He currently harvests chestnuts from 120ha of land.

After being recognized as an Excellent Forest Manager in 1983, he fine-tuned chestnut cultivation techniques such as cultivation methods, grafting methods, and prevention of disease and insect damage, and shared them with local farmers. This action further earned him a reputation and gave him the nickname of Dr. Chestnut. The local regions (Guryong, Eunsan, Naesan-myeon) are now designated chestnut production regions, and in June 1994, the Chestnut Agricultural Association Corporation was established. As a primary industry, the Association instituted a CA low temperature storage facility that could store approximately 1,500 million tons. Since 1995, the organization has pursued the packaging business of chestnuts. Members of the association are passionate and unified in their mission to promote the excellence of Buyeo chestnuts, which used to be of little significance just decades ago.

Gunhoon Lee compares chestnut cultivation to other fruits such as apples and pears. Strict management of fertilization, soil management, pest control, training and pruning improve the quality of the fruit and enable a continuous production of the fruit, meeting

high expectations. However, the industrialization policy has sent the labor force to the cities, leaving behind manpower problems on farms such as a shortage of workers, aging workers, increased wages for manpower, and lower farm prices. Lee wishes to develop cultivation techniques that will promote labor saving management and increased fruit quantity and quality, and strengthen the chestnut industry.

4.5.2. Pitfalls and Limiting Factors

Since the 1980s, chestnuts were the main export merchandise among crops that could raise income in the short term, and they were the main source of income in the rural regions. According to the study on the current situation of chestnut cultivation and policy conducted in 2003, the single tree renewal method applied to the chestnut trees afforested in the 1970s proved to be ineffective, resulting in the aged ratio of 53% for chestnut trees over 18 years.

In 1958, the chestnut gall wasp (Drycocosmus kuriphylus) attack extinguished most of Korea's native chestnut trees, a species that was suitable for the Korean soil. Korea has been developing species mainly through breeding, focusing on pest resistance, a large size and high yield. The characteristics of the native chestnuts such as sweetness, taste, cold resistance and storability that could be applied to developing excellent species were not actively considered.

Approximately 70% of the domestically grown cultivars were of the mid-ripening variety with a harvesting period of mid- to late-September, which incurred relatively higher labor and production costs. In the southern regions, more gall wasp resistant species such as Tsukuba, Arima, Ishizuchi, and Daebo were planted rather than Japanese species, which are more vulnerable to chestnut gall wasp such as Ginyose. Early ripening cultivars and late ripening cultivars were only 10% and 20%, respectively. By only disseminating the major cultivars, there was a lack of diversifying cultivars suitable for local site specifications , and harvesting times were adjusted.

Investigations of the current management of chestnut trees revealed a high reliance on the chemical fertilizer and airplane dusting and spraying. Environment-friendly technology such as organic fertilizers and biological pest control are fairly weak.

Neglecting to perform training, pruning and thinning caused excessive disease and insect damage, as well as lower quality and outputs. If pruning and thinning are intensively performed, not only will the output increase, but also the productive age from 18 years to over 30 years. The number of approved seedlings supplied by the Forest Environment Research Center takes up a mere 30% of the demand. Hence, unverified species being in circulation is also problematic.

Chestnut farmers mainly relied on a simple sales system of directly selling the harvested chestnuts to Nonghyup or other wholesalers. They have not been able to utilize the low temperature storage and manage storing of the chestnuts while waiting to put them in the market depending on the demand or market price. The distribution function of the forestry association was not practical.

The export of Korean chestnuts was highly reliant on China and Japan, and the diversification of export markets and the development of processing technology did not allow creation of demands in new markets. To increase export competitiveness, cultivation and pre -and post-harvesting management technology must be developed that will decrease production costs such as labor cost and increase efficiency.

To conclude, on the external side, exports of peeled Korean chestnuts have decreased along with decreased Japanese demand and an increased Chinese market share. Furthermore, China has been importing raw Korean chestnuts to peel and process and sell to Japan. On the other hand, due to low customs tariffs on frozen chestnuts, Korean imports of Chinese frozen chestnuts have continuously increased. To compete with China, the most chestnut producing country in the world, Korean chestnuts have to be both quality and price competitive. Problems on the internal side are low output and quality caused by aged chestnut trees, aging cultivators, and a lack of equipment. Also, the excellent characteristics of the Korean native chestnut trees should be restored, and pest resistant and superior species need to be constantly developed.

4.6. Implications for Developing Countries

4.6.1. National Economic Plan and Leadership of the President

Generating income from chestnuts formed a part of the national economic plan, which made the business plan and execution possible. Income generation from chestnuts gained momentum when it was chosen as one of the main projects to increase income in rural areas at the First 10-Year Forest Rehabilitation Plan.

The success of the national forestry business depends on the determination of the supreme authority and the government's active financial support. When the Korea Forest Service was established in 1967, the government budget on forestry was KRW 2.1 billion, tripled to KRW 6.2 billion in 1972, KRW 10 billion in 1973, and KRW 27.3 billion in 1978. The government also established a forestry development fund to give out loans for the chestnut business. The administrative and institutional systems, in addition to financial support, enabled the effective operation of the chestnut business.

4.6.2. Voluntary Participation of Villagers and Formation of Driving Entities

The hope of raising income in the rural and mountain areas and reduce poverty motivated farmers to participate voluntarily in the chestnut business. By forming driving entities such as the Saemaul agricultural society and town women's society, the Saemaul leaders actively participated in cooperative afforestation of chestnut trees and related businesses. Exemplary practices were published in forestry journals or Saemaul journals for information sharing, and they were recognized through presidential citations or grants to encourage competition.

4.6.3. Government's Active Promotion and Enlightenment

President Park Jung-hee strongly encouraged people to plant fruit trees like chestnuts for forest greenification, to resolve food shortages, and to increase incomes in rural and mountain villages. The government published a chestnut textbook that contained easy-to-understand and follow information for farmers.

Many competitions were held for Saemaul leaders or forest owners where the best business practices were presented, and the selected exemplary towns or owners were awarded. This not only quickly disseminated technology, but further motivated farmers through a sense of honor. In addition, the government actively enlightened the citizens by spreading the importance of tree plantation in newspaper, radio and Korea news.

4.6.4. Development and Dissemination of Chestnut Cultivars

It is essential to select and supply native chestnut species that are suitable for regional characteristics, pest resistant, processable, and adjustable in terms of the harvest period. Chestnut trees require intensive fertilization, and grafted seedlings rather than seedlings from seeds are better for inheriting the unique traits of the species. Therefore, it is important to create a stool bed for the supply of grafts.

The new varieties of chestnuts are developed through the hybrid breeding of useful traits between superior cultivars. As this takes a long period of about 15 years, the supply period may be shortened by selecting a certain variety and conducting local adaptability tests.

Chestnuts are suitable for growing in the central to northern warm temperate climate regions. They are shed intolerant trees that require eight hours of daily sunshine and are highly vulnerable to damage by frost. Frost damage occurs heavily in the wetlands and southward and westward areas. Also, the damage increases when excessive nitrogenous fertilizers are used before the age of 4 to 5, during summer or fall fertilization in addition to spring, and through excessive pruning, that causes spindly growth.

4.6.5. Mechanization of Chestnut Cultivation and Development of Chestnut Processing Machinery

For intensive fertilization of chestnuts that leads to environmentally-friendly cultivation and increased productivity, introduction of machinery helps to reduce labor costs. The effective collection and processing of chestnuts requires the development of equipment for harvesting, collecting, pericarp removal, and sorting. For the expansion of domestic sales and export markets, a variety of chestnut products should be developed to create new demand.

4.6.6. Establishment of a Chestnut Marketing System

Chestnut farmers in Korea mainly depended on a simple sales system of directly selling the harvested chestnuts to Nonghyup or wholesalers. A rational distribution system is necessary for ensuring a low-temperature storage facility where chestnuts can be stored, thereby enabling the adjustment of when the product is put on the market according to demand and market price.

Korea has endeavored to make self-help efforts to establish a chestnut distribution system such as the Forestry Association, which sets up directly-managed joint agricultural products markets. The efficient operation of the distribution system from production and gathering to sales and exports ensures price stability and increased export sales, resulting in increased farm income.

2013 Modularization of Korea's Development Experience
Forest Resource Development in Korea

Chapter 4

Conclusion

Conclusion

After the end of World War II in 1945, due to political and social turmoil after the establishment of the Republic of Korea in 1948, followed by around three years of Korean War that broke out in 1950, forests in the Korean Peninsula faced severe devastation. Furthermore, the social, economic structures and infrastructures of South Korea had been almost completely destroyed. As a result, South Korea became one of the poorest countries in the world.

South Korea received support from official development assistance projects provided by the international community including the United Nations and the United States even before establishing its government. Korea succeeded in the First and Second 5-Year Economic Plans focusing on the heavy chemical industry that started in 1962. With the beginning of the Third 5-Year Economic Development Plan in 1972, the need to establish long-term plans for food production and forestry was recognized, and systematic forest resource development began.

The direct contribution of forests to the national economy was not significant in number (2.8%), and is relatively small compared to the manufacturing industry. However, the indirect benefits of forests are very significant and cannot be overlooked. For example, forests help to prevent damage to people and properties caused by related industries and floods. Furthermore, forests contribute to improving land productivity through minimization of soil erosion and to the conservation of the environment by keeping a balance between wood supply and demand, improving air and water purification capability, and providing places for recreation.

In the early 1960s, the forest rehabilitation plan was established at an elementary level, but it had a limited budget and remained behind in terms of investment priorities. However, as forest areas accounted for 65% of the country, and more than 50% of people lived in

rural and mountain villages, the importance of forest rehabilitation and forest resource development had always been emphasized. Due to the strong leadership of the military government from 1962 and national participation in the *Saemaul Undong* in the 1970s, and in addition to the will of the President, forests in South Korea were restored, and forest resources also began to be developed.

After the independence of Korea until 1970, forest policy was mainly focused on forest protection emphasizing the control of excessive use of forests. However, in fact, when this sort of control policy is sustained for a long time, the social side effects become exposed, causing the loss of effectiveness. Therefore, it was a desirable shift to change the policy direction from top-down government-led control for forest greening to *Saemaul Undong* with national participation.

Forest resource development is a long-term national business. This is difficult since various relevant authorities participate in the business. It also requires the active participation of the people. Meanwhile, economic development provided the momentum for successful forest rehabilitation. In the background of a successful arrangement of slash-and-burn fields from 1965 to 1979, farmers could be absorbed into the cities due to the success of the export-driven industrial policy and job creation in industrial fields.

The factors that enabled Korea, which was the poorest country with devastated forests right before desertification, to successfully develop its economy for a short-term period and succeed in forest rehabilitation and forest resource development are summarized as the following.

First, the leadership of the President and strengthening of the forest administration system were integral to Korea's success. Although the country was poor after the establishment of the Republic of Korea, the President decided that the organization of forest administration should be independent. Thus, the organization was able to establish and manage forest resources for about 15 years under the Ministry of Home Affairs with the strong protection of the police force. Although it was a temporary measure, it is not easy to find such a case in the world in which forests were administered under the Ministry of Home Affairs with the strong administrative power of local governments and the police force. In particular, poplar and chestnut trees, which were supported by name by the President, was a reflection of the President's commitment to local residents; and after the harvest of forest products, funding for local development and scholarships were provided to local students, further attesting to the importance of forest resources.

Second, the implementation of a forest master plan was connected to the national economic development plan. The Republic of Korea was established based on a liberal democracy, and 5-year economic development plans were established to firmly develop

the national economy in a short time under the capitalistic economy. In the forestry sector, 10-Year plans were established in connection with this economic development plan. Since 1973, five master plans have been established and implemented in accordance with the circumstances of the era. The forest master plan was not only for the forestry sector, but it was also connected to the national master plan. As a result, the plan was able to contribute to raising awareness, gaining the support of the people, attaining government budget, and promoting cooperation and collaboration with local governments.

Third, the establishment and use of Forest Cooperatives enabled the participation of forest owners and local residents. The forests on the Korean Peninsula have historically belonged to the country, and local residents also protected and used forests together. Since the 20th Century, forests have been rapidly devastated and become more privatized. For forest rehabilitation, the government established forest administrative system. In addition, the government also aligned forest organizations such as forest village associations and Forest Cooperatives to facilitate the implementation at the local level. At the beginning, the main goal of these organizations was to mobilize people for forest conservation and afforestation and to boost the income of local residents. However, after forest greening was completed, these organizations turned to the cooperatives of forest owners. Forestry managers have done important work in various fields including forest resource development, collection, marketing, and financing. The diligence of the people was a source for activating the forest resource development business.

Fourth, Korea began to perform research and development (R&D) in forest resources development. From the early days, R&D was actively used for rehabilitation of devastated forests in Korea. It enabled the development of fast-growing species for quick forestation and ground covering grasses for forest rehabilitation, forest soil investigation to plant the right trees on the right sites, systematic forest resources investigation, periodic monitoring, development of new species for forest resource management especially in fruit trees for high yield and high income, selection of disease-enduring and pest-resistant species, development of various systems and standards to improve the availability of forest resources and scientification of forest resources processing technologies. The income of forest owners improved with foreign currency earned through expanded exports. In particular, R&D helped to promote the awareness of the people by uncovering new values in forest resources in the global environment era through scientific investigations of various characteristics of forest resources.

Fifth, Korea implemented policies and legislation that were appropriate to the needs of the time. During the early 10 years after the establishment of the government, forest resources could not be systematically managed, and forest devastation deepened further due to the lack of legislation. Since the implementation of the Forest Law in 1962, various

laws related to forests have been enacted and amended, which have formed the foundation for policy development and implementation. The early Forest Law included the overall content for forest protection, rehabilitation and forest cooperatives; however, it has become divided in order to quickly respond to fast-changing circumstances of the era. In particular, after the 1990s, the Forest Law was abolished, and new legislation related to forest resource development responding to biodiversity and climate change was introduced. These issues have been prominent since the Rio conference in 1992, and were followed by the forest resource development act and forest promotion act, which were enacted to help promote the effectiveness of forest resource management.

Sixth, forest resource development projects, which were suitable for the period and national income, benefited forest owners and nationals, also greatly contributing to the national economy.

- 1950~1970s – guarantee a basic standard of living through the supply of forest resource
- 1950~current – income raising through intensive major forest product management (chestnut, oak mushroom, etc.)
- 1960~1980s – contribute to domestic economic development through plywood export promotion using overseas forest resources
- 1970~1980s – maximize income of local residents through sales and improve exports of all available collected and cultivated forest products
- 1970~1990s – establish the foundation for forest resource development by implementing planned forestation and silviculture on the basis of the people's diligent participation.
- Late 1980s~current – values as environmental goods such as recreational sources or public forest functions were assigned
- mid-1990s~current – activate the production of forest byproducts through the promotion of agroforestry after local decentralization
- 2000~current – develop and use forest resources as a source for forest therapy and cultural welfare to raise the level of satisfaction in utilizing forest resources.

Although the decline of forests in the world is slowing in the 21st Century, the impact of forest resource development, which affects the income of local residents in forest villages and conservation of the global environment, is gaining more attention internationally compared to the past. Forest resources should be developed in the most effective way for local residents, nationals and the country according to circumstances of the era and national income. For this, legislation and institutions should be properly founded, and field-oriented policies need to be developed.

With the effectively aligned forest administrative system, autonomous organizations in local community that can induce the active engagement of forest owners and villagers also need to be organized. There have been many cases where a policy was ineffective because the local government system and organizations for field implementation were weak, despite the strong policies and legislations at the central government level. Therefore, it is necessary to prepare a monitoring and feedback system in order to frequently check the field. The 21st Century requires forest resource development not only at the national level but also at the international level in terms of international consensus and discussions. Therefore, national strategies for forest resource development should be established in accordance with the requirement of international conventions regarding biodiversity, climate change and combating desertification; and the principle of Sustainable Forest Management (SFM). Furthermore, forest resources should be developed, reflecting circumstances of the era when gathering the opinions of local residents becomes more important compared to the 20th Century.

In conclusion, it is noteworthy that forest resource development can be successfully achieved when all available domestic forest resources are utilized in a sustainable manner, taking into consideration both domestic and international circumstances. The effort should enjoy the support of the general public, the nation's top leaders and relevant administrative organizations. Forest resource development policy should have a solid legal basis, accompanied by the activation of private organizations in the field and sufficient financial support.

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Table 1 | Production, Income and Export of Non-Timber Forest Products (NTFPs) by Forestry Cooperatives

(Unit: Amount – M/T, Price – Won/kg, Income – 1,000 Won, Value –1,000$)

Classification	Pine Mushroom				Oak Mushroom			
	Group Selling Amount	Supply Unit Price	Farmer's Income	Export Value	Group Selling Amount	Supply Unit Price	Farmer's Income	Export Value
1962	49	-	-	-	79	-	-	-
1963	42.2	-	-	-	73	-	-	-
1964	41.8	-	-	-	94	-	-	-
1965	24.2	-	-	-	72	-	-	-
1966	34.9	-	-	-	74	-	-	-
1967	59.4	-	-	-	66	-	-	-
1968	118.2	500	59,000	76	139	1,110	153,000	278
1969	140.1	500	70,000	412	160	1,200	192,000	402
1970	189	1,000	189,000	605	187	1,300	243,100	747
1971	52.7	1,130	64,400	788	208	1,700	353,600	765
1972	156.4	1,590	25,000	1,237	265	2,000	530,000	1,134
1973	204.7	3,000	612,000	2,970	304	3,000	912,000	2,762
1974	123.4	4,114	507,577	1,718	337.3	3,500	1,050,000	1,850
1975	499	4,105	2,048,477	6,279	360.9	4,000	1,400,000	2,950
1976	243.4	7,852	1,911,436	4,905	393	4,600	1,807,800	4,536
1977	327.5	11,719	3,838,007	8,858	689	6,500	4,519,840	9,135
1978	983.2	16,685	16,405,543	25,875	674	7,400	5,034,780	9,037
1979	470.3	21,062	9,905,459	16,370	607	6,100	3,745,190	8,857
1980	348.8	24,305	8,477,687	13,521	706.6	7,000	4,995,662	10,704
1981	492.1	20,607	10,140,991	16,840	368.4	8,000	2,972,907	5,935
1982	315.4	24,125	7,609,280	10,384	197	8,570	1,688,290	2,989
1983	1,237.5	16,380	20,270,250	28,013	495	16,080	2,989	13,693
1984	769.1	23,120	17,781,691	24,064	239.8	13,724	3,291,104	9,085
1985	1,313	20,945	27,501,095	32,831	346	12,689	4,390,563	10,622
1986	311.4	84,598	26,343,832	30,272	356	12,668	4,510,023	12,674
1987	657.3	46,368	30,481,127	40,253	399.2	15,224	6,077,895	21,764
1988	489.5	63,651	31,145,134	46,682	175.2	12,306	2,155,757	16,665
1999	399.7	84,527	33,785,538	44,631	250	24,897	6,225,594	7,711
2000	316.2	66,077	20,871,371	31,086	208.2	25,054	5,216,243	5,102
2001	158.7	164,378	26,086,728	-	204.2	23,502	4,799,076	-

Source: FCF, 2002.

Classification	Grass seed				Chestnut			
	Group Selling Amount	Supply Unit Price	Farmer's Income	Export Value	Group Selling Amount	Supply Unit Price	Farmer's Income	Export Value
1962	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-
1967	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-
1973	500.4	875	550,375	2,170	-	-	-	-
1974	380.6	1,205	389,500	1,495	-	-	-	-
1975	-	-	-	-	-	-	-	-
1976	34	800	27,200	-	234	401	93,834	600
1977	20	873	17,460	50	501	541	271,041	3,047
1978	28	885	24,780	62	1,473	560	824,880	8,230
1979	67	1,715	114,905	238	1,524	569	867,156	14,456
1980	-	-	-	-	1,419	940	1,333,860	36,771
1981	9	2,800	25,200	-	1,930	633	1,222,476	26,255
1982	55	4,000	220,000	208	1,451	717	1,039,951	25,023
1983	30	4,600	138,000	76	2,899	532	1,543,088	38,814
1984	100	5,500	550,000	252	3,516	805	2,832,131	47,117
1985	40.9	5,200	212,680	138	5,511	597	3,291,981	37,427
1986	43	5,200	223,600	333	4,559	826	3,796,953	53,072
1987	48.4	5,400	261,360	718	4,878	1,065	5,198,929	83,957
1988	27.2	5,800	157,760	304	5,112	848	4,337,279	91,852
1989	19.3	7,500	144,750	164	3,461	677	2,343,712	81,353
1990	46.7	14,756	689,103	-	3,377	833	2,813,992	94,279
1991	-	-	-	8	1,596	1,092	1,743,115	104,251
1992	-	-	-	-	1,962	982	1,925,870	101,888
1993	-	-	-	-	468	1,583	741,000	95,006
1994	-	-	-	-	530	1,530	813,000	140,707
1995	-	-	-	-	472	1,528	721,037	114,768
1996	-	-	-	-	650	1,028	668,230	99,749
1997	-	-	-	-	1,673	1,286	2,150,712	88,393
1998	-	-	-	-	1,201	1,302	1,564,125	65,284
1999	-	-	-	-	2,399.8	2,351	5,641,859	85,017
2000	-	-	-	-	2,831	2,440	6,907,640	89,044
2001	-	-	-	-	2,131	1,400	2,983,400	-

Source: FCF, 2002.

Classification	Oak bark			Fabric from Arrowroot			
	Group Selling Amount	Supply Unit Price	Farmer's Income	Group Selling Amount	Supply Unit Price	Farmer's Income	Export Value
1962	2,080	5	9,730	93.5	148.5	13,761	312.4
1963	865	5	4,330	119.8	150.7	17,666	779.3
1964	812	6.8	5,513	128.5	206.7	25,803	818.6
1965	1,000	9.2	3,800	185.3	268	45,410	1,475
1966	1,005	9.2	8,830	269.7	322.7	75,561	1,951.4
1967	1,010	9.2	8,830	58.3	298.7	16,168	1,675.7
1968	1,000	10	10,000	174.1	355	56,223	23,627
1969	990	12	12,000	233.4	417.3	90,559	25,485
1970	856	15	12,850	381	618.7	203,200	4,114.90
1971	600	18	10,800	232.1	689.3	134,927	3,477
1972	770	21	16,170	204	721.3	125,114	4,306
1973	781	27	21,100	351.2	884	272,531	6,259
1974	934	35	32,700	297.3	1,265	338,843	11,900
1975	817	40	32,700	392.1	1,866.7	663,955	12,000
1976	616	48.7	29,933	341.4	2,080	634,321	19,500
1977	705	73.6	51,931	658.1	2,433	1,660,671	31,719
1978	790	93.4	72,436	329.2	2,809	924,798	12,000
1979	874	151.3	132,248	166.8	3,340	557,122	11,374
1980	475	202.4	96,175	215.6	4,410	950,966	34,907
1981	281	212.4	59,597	134.2	5,110	685,737	35,579
1982	223	230	51,290	87.7	5,237	459,274	24,941
1983	261	250	65,250	31.2	5,355	167,079	29,548
1984	151	265	39,882	18.2	5,503	100,155	17,096
1985	53	270	14,414	8.9	6,119	54,461	16,460
1986	44	270	11,769	-	-	-	-
1987	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-

Source: FCF, 2002.

Table 2 | Brief History of Forest Resource Development

Period	National Forest Plan	National Economic Plan	Forest Resource Development	Remarks
1940's~ 1950's	-	-	'51. Temporary Measures for Forest Conservation Act	'45 Independence '48 Foundation of Rep. of Korea '50-'53 Korean War
1960's		The 1st Plan ('62~'66) The 2nd Plan ('67~'71)	'61. Enactment of Control Law on Forest product '61. Enactment of Forest Law '62. Organization of Forestry Association '62. Enactment of Law on Erosion Control '68 Fuel wood Forest establishment 5 yrs Plan	'61 Military Revolution
1970's	The 1st Forest Plan (1973~1978)	The 3rd Plan ('72~'76) The 4th Plan ('77~'81)	Start of Forest fuel Policy '73 Moving Forest Service into Min. of Interior '79 Peak of Plywood Export	'70 Start of Saemauel Undong '73.10 Middle East War '74.1.1. The 1st Oil Shock '78.10. The 2nd Oil Shock
1980's	The 2nd Forest Plan (1979~1987)	The 5th Plan ('82~'86) The 6th Plan ('87~'91)	'80 Amendment by Law on Forestry Association '85 Decline of Plywood industry '88 Establishment of Recreation Forest '89 Published the 1st Forest's Public Function Value (based on '87)	'88 Opening of the 24th Olympic Games in Seoul
1990's	The 3rd Forest Plan (1988~1997)	The 7th Plan ('92~'96)	'95 Introduction of Local Autonomy '95 Introduction of Agroforestry (focused on Non Timber Forest Products) '95 Strengthening of forest product marketing facilities '97 Enactment of Forestry Promotion Act	'92 Opening of UNCED (Earth Summit) '98 Outbreak of IMF financial crisis '98 Abrogation of Economic Development Plan
2000's	The 4th Forest plan (1998~2007)	-	'02 Enactment of management of Mountainous Districts Act '05 Enactment of Forestry Culture & Recreation Act '05 Enactment of Creation & Management of Forest Resources Act '06.8 Abrogation of Forestry Law	-
2010's	The 5th Forest Plan (2008~2017)	-	'12 Organization of Korea Forestry Promotion Institute '13 Publication of the 6th Forest's Public Function Value(based on '87)	-

Source: Yoo (organized by the author).

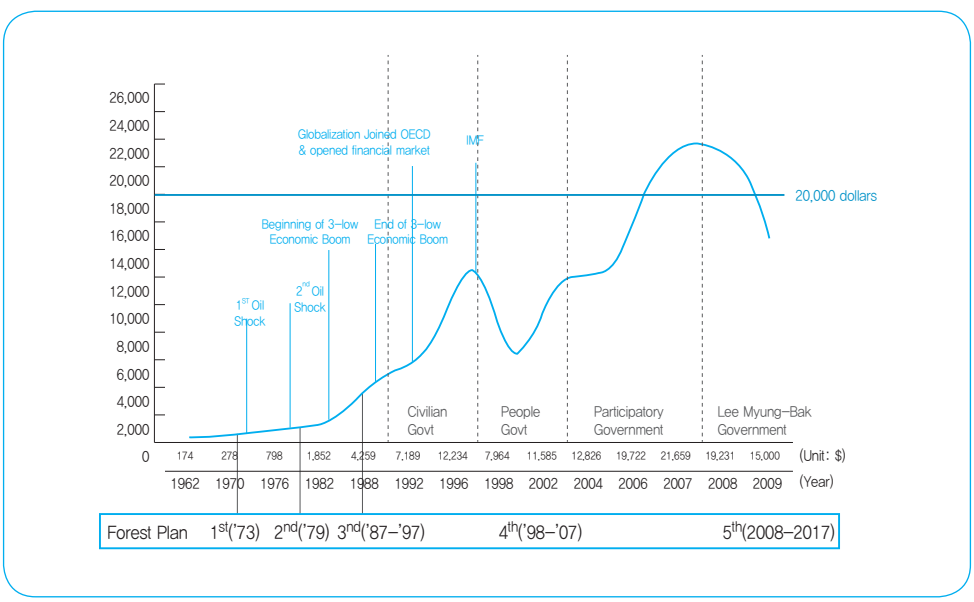
Table 3 | GNI per Capita in the Republic of Korea

(Unit :$)

Year	GNI per Capita	Year	GNI per Capita
1970	255	2001	10,631
1980	1,660	2002	12,100
1990	6,303	2003	13,460
1991	7,276	2004	15,082
1992	7,714	2005	17,531
1993	8,402	2006	19,691
1994	9,727	2007	21,632
1995	11,735	2008	19,161
1996	12,518	2009	17,041
1997	11,505	2010	20,562
1998	7,607	2011	22,451
1999	9,778	2012	22,708
2000	11,292	2013	

Source: The Bank of Korea, ECOS.

Figure 1 | Trend in Gross National Income(GNI) per capita and Forest Plan



Source: Bank of Korea, ECOS (reorganized).

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