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United Nations



Integrated policy for forests, food security and sustainable livelihoods

Lessons from the Republic of Korea

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FOREWORD

The International Conference on Forests for Food Security and Nutrition, held at FAO headquarters in Rome in May 2013, emphasized the importance of mainstreaming cross-sectoral forestry and food security policies and programmes in order to recognize and enhance the contributions of forests to sustainable livelihoods. Indeed, it has been shown that sustainable forest management policies and programmes that are well integrated into other sectors and into rural community development ensure not only greater socio-economic benefits – including food security and nutrition – but also a greater number of beneficiaries.

The Republic of Korea's national Forest Rehabilitation Plans, which have been implemented since 1973 in ten-year cycles, serve as an exemplary case. Especially in the 1970s and 1980s, these plans were implemented within a community development framework intended to improve the agricultural environment, raise living standards, reduce the income gap between urban and rural communities and solve food problems. Successful implementation of the plans not only made forest and landscape restoration possible at the national level, but also delivered food security benefits and contributed to economic development.

In many countries deforestation and forest degradation have been associated with a decline in rural socio-economic conditions, as occurred in the Republic of Korea in the 1950s and 1960s. Where this is the case, revitalizing forests' contribution to food security through reforestation and rehabilitation of degraded forest can become a daunting undertaking, especially in the mountainous or otherwise remote areas where deforestation and degradation often occur. Forest rehabilitation requires a long-term approach, which can be difficult to implement when securing food for survival is the main focus.

This publication, produced in collaboration with the Korea Forest Service (KFS), offers an opportunity to learn from the country's highly successful experience in formulating and effectively implementing integrated forest rehabilitation and food security policies and programmes. We hope that the experience described here can be a source of inspiration for integrated forestry, food security and sustainable livelihoods in other countries and regions.



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ACRONYMS

FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
IBRD	International Bank for Reconstruction and Development
IFAD	International Fund for Agricultural Development
KDI	Korea Development Institute
KFRI	Korea Forest Research Institute (renamed National Institute of Forest Science in 2015)
KFS	Korea Forest Service
KRW	Korean won
KSC	Korea Saemaul Undong Center
MAF	Ministry of Agriculture and Forestry, Republic of Korea
MOHA	Ministry of Home Affairs, Republic of Korea
MSF	Ministry of Strategy and Finance, Republic of Korea
NWFP	non-wood forest product
WFP	World Food Programme

EXECUTIVE SUMMARY

The Republic of Korea is a mountainous country where the people have traditionally had a high reliance on forests for timber, fuelwood and non-wood forest products such as mushrooms and edible wild greens. In the 1950s and 1960s, it was one of the poorest and least developed countries in the world. Half of the country's forest cover had been lost through slash-and-burn agricultural practices, large-scale land conversion and overextraction of fuel and timber. The deforestation resulted in severe erosion and exacerbated damage from repetitive droughts and floods, leading to decreased agricultural production and loss of lives and property. In short, attempts to meet food security needs resulted in severe deforestation and paradoxically became the main factor threatening food security. Breaking this vicious circle was the rationale for an intensive forest rehabilitation programme that began in the 1960s, crowned in the 1970s and 1980s by two Ten-Year Forest Rehabilitation Plans which achieved complete rehabilitation in merely two decades.

The government perceived that restoring forests, especially in mountain watersheds, would help prevent agricultural disaster, provide a solid foundation for food production and be fundamental in overcoming poverty and developing the national economy. These goals were achieved by integrating forestry, rural development and community mobilization in the rehabilitation policy.

To mobilize people's participation nationwide, the government integrated the rehabilitation plans with the New Community Movement (*Saemaul Undong*), a community-based, integrated rural development programme initiated in the early 1970s to improve village conditions, introduce new attitudes and skills and reduce the income gap between urban and rural communities. *Saemaul Undong* contributed to the reforestation through small-scale village-level self-help projects emphasizing community cooperation. Community projects on nurseries, forest plantations, erosion control and fuelwood plantations galvanized people's participation and were central to the success of the forest rehabilitation effort. They provided job opportunities compensated by food or wages which helped people overcome hunger and brought vitality to the rural economy.

This study demonstrate how the national Forest Rehabilitation Plans incorporated food and nutrition objectives, highlighting the important socio-economic benefits of forest rehabilitation in improving food security and sustainable livelihoods. It is based on existing literature, secondary data and structured interviews with people from a wide range of perspectives, from policy-makers to project participants and villagers.

CONTRIBUTIONS TO FOOD SECURITY

The 1996 World Food Summit defined food security as "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" and described four dimensions of food security: availability, access, utilization and stability. This study demonstrates how the forest rehabilitation in the Republic of Korea contributed to satisfying all four.

- **Food availability.** In times of need people had always harvested forest foods such as wild edible plants, mushrooms and nuts. As part of the rehabilitation effort, planting of fruit- and nut-trees, especially chestnut, was promoted to contribute to the alleviation of food shortage.
- **Food access.** Income from harvest and sale of wood and non-wood forest products and from planting of fruit- and nut-trees (especially chestnut) enabled people to buy food. Other sources of income include participation in forest rehabilitation projects and, in more recent years, provision of services in recreational forests.
- **Food utilization.** Fuelwood was traditionally used for cooking, but to lessen pressure on the forests the government introduced alternatives to fuelwood for cooking and banned the use of fuelwood in 20 cities. The decline in fuelwood use allowed the conversion of existing fuelwood plantations to wood production, benefiting the economy. Restored mountain forests contribute to food utilization by supplying a naturally purified water supply for cooking and other uses. Finally, increased production of foods from the rehabilitated forests (e.g. chestnuts, pine nuts) provides energy and nutrients and diversifies diets, which during times of hunger were based mainly on carbohydrates (cereals, potatoes and pulses).
- **Stability of food security.** Forests provide a food safety net and sustain a healthy environment conducive to food production; they protect farmland and water supply and thus contribute to increased sustainable crop production.

With the country's ongoing rapid economic development, the roles of forests in the four dimensions of food security have changed over time. Until the 1960s, during the time of absolute poverty, forests primarily had a role in food availability. With accelerated economic growth and the implementation of rehabilitation projects, the food access aspect of food security gained importance, as income earned from participating in rehabilitation activities greatly contributed to solving food problems. In addition, the role of forests in providing clean drinking-water supported the utilization aspect of food security. With their complete rehabilitation, forests became more important in the stability of food security by controlling erosion and protecting watersheds for the improvement and stabilization of agricultural productivity. Today, in a prosperous society, the demand for the recreational, rest and healing functions of forests is increasing rapidly, especially among the urban population, and the demand for related services creates employment among the rural population which contributes to rural income and food security.

LESSONS LEARNED

The experience in the Republic of Korea demonstrates that achieving food security through forest rehabilitation and sustainable management is most successful if the following prerequisites are met:

- an integrated approach to ensure that all relevant sectors work towards the same goals and not at cross-purposes;
- people's participation and opportunities for them to benefit (including opportunities to earn income);
- strong political will and leadership to create the necessary framework, infrastructure, motivation and will;
- a holistic approach to economic and social development.

In short, the success of the forest rehabilitation and its ability to have a positive impact on food security rested on effective policy and leadership resulting in cooperation of the government and the citizens. Although some of the food security successes achieved in the Republic of Korea's forest rehabilitation programme were unplanned, lessons from this experience can provide inspiration for other developing countries desiring to incorporate forest rehabilitation and sustainable management in their food security goals and policies.



1. INTRODUCTION

In the Republic of Korea, forests are defined to include not only stands of timber and bamboo and the land on which they are growing, but also land that has temporarily lost its stands of timber and bamboo (KFS, 2012). Because of the way it is defined, the country's forest area has remained relatively constant over time; almost two-thirds of the country's land is classified as forest. However, the growing stock tells a different story (Table 1). In the 1950s, much of the cover on forest land was lost through unsustainable exploitation (see Chapter 2).

The people of the Republic of Korea have traditionally had a high reliance on the forests, which are predominantly located on steep or mountainous land. The country suffered extreme poverty in the 1960s, with a nominal gross domestic product (GDP) of less than USD 100 per capita (Statistics Korea, 2015a) and numerous food problems. Despite its harsh situation, the Republic of Korea achieved comprehensive forest rehabilitation in just two decades. The successful restoration of dense forests (Table 1) was achieved by adopting a rehabilitation policy that integrated forestry, rural development and community mobilization and elicited the active participation of the citizens. The success of these efforts paralleled the rapid and dramatic economic growth of the country; per capita GDP was USD 3 467 in 1987 when the national reforestation goal was achieved (Statistics Korea, 2015a).

Many studies have been carried out on aspects of the Republic of Korea's successful reforestation (Bae, Joo and Kim, 2012;

Korea Forest Policy Society, 1975). While these studies offer good insights on the forest rehabilitation experience, most often they focus on its outcome in the forest sector (e.g. increased forest resources) rather than exploring links to other sectors, for example, the impact on socio-economic development, including food security. As a result, the wider success of the process has been underestimated.

The Republic of Korea's experience of forest rehabilitation and enhanced food security is an exemplary case that may provide lessons on overcoming extreme poverty for other developing countries facing a similar situation. Accordingly, this publication reviews the two Ten-Year Forest Rehabilitation Plans that were implemented from 1973 to find evidence of how they incorporated food security objectives. In particular, it highlights the important socio-economic benefits of forest rehabilitation in improving food security and sustainable livelihoods.

The study takes the following approach:

- It reviews how the hunger and poverty situation in the 1960s triggered the national Forest Rehabilitation Plans.
- It analyses whether and how the food security objectives were integrated into the forest rehabilitation policy and programme. In addition, it discusses the key role of the New Community Movement (*Saemaul Undong*) in implementing the forest rehabilitation.
- It evaluates the impact of the reforestation programme on national food security and draws conclusions

Table 1. Changes in forest growing stock, 1955–2010

Year	Total land area (1 000 ha)	Agricultural land area (1 000 ha)	Forest area ^a (1 000 ha)	Growing stock (m ³ /ha)
1955	9 925	–	6 671	8.7
1960	9 843	–	6 701	9.6
1965	9 843	–	6 614	9.0
1970	9 847	–	6 611	10.4
1975	9 881	–	6 635	15.9
1980	9 899	–	6 568	22.2
1985	9 914	2 220	6 531	22.5
1990	9 928	2 179	6 476	38.4
1995	9 928	2 048	6 452	47.9
2000	9 946	1 973	6 422	63.5
2005	9 964	1 881	6 394	79.2
2010	10 003	1 773	6 369	125.6

^a The Republic of Korea defines forest as including not only stands of timber and bamboo and the land on which they are growing, but also land that has temporarily lost its stands of timber and bamboo.

Source: KFS, 2015; agricultural land area from World Bank, 2015

about the main success factors in achieving food security without deforestation.

The analysis was carried out through review of existing literature and secondary data. To provide empirical evidence on the implementation of the integrated policy in the field, structured interviews were conducted with people from a wide range of perspectives, from policy-makers to project participants and villagers.

It is important to note that while the policy-makers wanted to combat hunger and poverty through forest restoration (e.g. through its contribution to increased agricultural productivity), the national Forest Rehabilitation Plans were not explicitly designed to achieve food security and sustainable livelihoods. However, the food security objectives were well embedded in the actions that were implemented. Because the link between forests and food security was not consciously recognized by the policy-makers or the beneficiaries during the implementation of the Forest Rehabilitation Plans, there are almost no data on the improved food security status

of the beneficiaries as such. Furthermore, much of the existing information on the food security impact is rather more qualitative than quantitative.

FORESTS' CONTRIBUTIONS TO FOOD SECURITY

The 1996 World Food Summit defined food security as “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996). The four dimensions of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security (FAO, IFAD and WFP, 2013). Food security is regarded as achieved when the four dimensions of availability, access, utilization and stability are satisfied.

It is estimated that over 2.4 billion people worldwide depend on forest goods and services for the direct provision of food, woodfuel, building materials, medicines, employment and cash income (FAO, 2014). Forests contribute to the four dimensions of food security in multiple ways.

Food availability is provided, for example, by the quantitative contribution of edible non-wood forest products (NWFPs) to national food supply and by the indirect contribution of forest ecosystem services to increased agricultural productivity. For instance, more than 50 million people in India depend directly on forests for their food and good nutrition. In 2011 it was estimated that 80 percent of the population of the Lao People's Democratic Republic consumed wild foods from forests daily (FAO, 2011).

Forests contribute to access to food through employment and cash income generated in the forest sector, which enable households or individuals to purchase food, thereby supporting diversified and healthy diets. Income generated globally in both the formal and informal forest sectors accounted for USD 730 billion in 2011 (FAO, 2014). Income generation from the forest sector is the main driver of economic access to food for forest-dependent households.

Food utilization – the physical ability to obtain sufficient nutritional intake and nutrition absorption – is facilitated through cooking, which fuelwood makes possible, and through the provision of nutrients

by edible forest products. Over half of all wood produced in the world is used for energy, contributing to the food security of the 2.4 billion forest-dependent people who rely on fuelwood not only for cooking, but also for water sterilization (FAO, 2014). FAO estimates that about 765 million people (10.9 percent of the global population) use wood energy to boil and thus sterilize their water. This is often the only available means that forest-dependent communities have to make water safe for drinking and food processing.

Stability of food security is the sustaining of the other three dimensions. Forest ecosystem services support all agricultural and fishery production (through maintaining or restoring soil fertility and protecting watersheds and watercourses) and biodiversity conservation for many local species that are important for local diets and traditions. Healthy forests and sustainable forest management are crucial to provision of these ecosystem services. In addition, in times of climatic shock and livelihood risk, forests' resilience enables them to provide a safety net that is key to attaining sustainable food security (Table 2).

Table 2. Four dimensions of food security and their linkages to forestry

Four dimensions of food security	Definition	Applicable level	Examples of linkages to forestry
Food availability	Total available food = production + imports + aid + exports – waste	National	Availability of edible non-wood food products
Access to food	Economic, physical, social and legal access to food	Households and individuals	Increased household income from wood and non-wood forest products
Food utilization	Physical ability to obtain sufficient nutritional intake and nutrition absorption	Individuals	Fuelwood for cooking Access to clean water for drinking and cooking Provision of micronutrients
Stability of food security	Stability of availability, access, and utilization at all times without risks	All levels	Safety net in times of need Climate change mitigation and adaptation through sustainable forest management

Source: Jin and Reeb, 2014



2. THE SITUATION BEFORE REHABILITATION: forest degradation, hunger and poverty

During the Korean War (1950 to 1953), more than half of the forest area in the Republic of Korea became bare. For many years after the war, the forest degradation continued owing to the increased population; with a population growth rate of 1 to 3 percent per year between 1949 and 1970, the population grew from 20 million to 31 million (about a 55 percent increase over the period) (Statistics Korea, 2015b). Most of the people struggled to put food on the table, and food security was a national problem.

ACUTE FOREST DEGRADATION AND DEFORESTATION

Deforestation had occurred in the territory of the Republic of Korea even before the eighteenth century, but the procurement of war supplies at the end of the Japanese occupation and the population growth after liberation accelerated deforestation.

During the Korean War, forests were destroyed through years of rampant harvesting of trees for fuel and timber (Photos 1 and 2). Although forest area statistics for the period are unreliable, it is estimated that about half the forest area was lost. Forest growing stock volume dipped to 8.7 m³ per hectare just after the war (1955), compared to about 13 to 14 m³ per hectare in the early 1940s (KFS, 2015). This was the period of the worst forest degradation in the history of the Republic of Korea.

POVERTY AND FOOD INSECURITY

Following the Korean War the Republic of Korea was one of the poorest and least developed countries in the world, with a nominal GDP of USD 65 per capita in the 1950s and USD 79 per capita in the 1960s (Statistics Korea, 2015a).

The forest degradation resulting from the Japanese occupation and the Korean War



1. The Korean War and poverty resulted in devastation to mountains and forests (Donam area, Seoul, 1960s)



2. Overharvesting of fuelwood for cooking was one of the main causes of deforestation prior to the 1970s

was a large obstacle for the government in reconstructing the country and raising people's standard of living. Excessive soil erosion resulting from the severe degradation of mountain forests (Photo 3) caused elevation of the river beds, so that monsoon rainfall caused flooding of land and villages. The cumulative damage from repetitive droughts and floods led to decreased agricultural production, destruction of roads and industrial facilities, and loss of lives and property (Ministry of Works, 1971) (Photo 4). For example, between 1957 and 1961, floods resulted in the loss of 1 300 lives and the damage or loss of 199 000 ha of farmland; and in 1967, extreme drought resulted in an agricultural disaster, damaging 0.4 million hectares of farmland and jeopardizing the food security of 660 000 households (Korea Forest Policy Society, 1975).

In a vicious circle, the deforestation accelerated poverty, and poverty accelerated deforestation. Many people survived on edible roots or tree bark while begging and borrowing money. Countless people became nomadic, and many died of starvation. Of the 2.5 million farming households, 2 million skipped meals during the spring when winter food stores became depleted, which clearly indicates that most farming households suffered food shortage. Records show that in the 1950s, 700 000 children went hungry (MAF, 1999).



3. Severe erosion resulting from degradation of mountain forests in the 1960s



4. Flooding after heavy rain in Hongchun, Gangwon Province, early 1970s

People had no choice but to go to the forests for food and fuel.

Because of this situation, planting trees for forest rehabilitation was a matter of life and death. To alleviate poverty and hunger, measures for mitigating the impact of extreme droughts and floods were necessary.

SLASH-AND-BURN AGRICULTURE

Slash-and-burn agriculture, which was widely practised during the days of extreme poverty, was a major cause of forest degradation (Photo 5). Slash-and-burn agriculture was a method of cultivation without fertilization involving the removal of plants and trees by setting fires. It often led to the outbreak of forest fire which caused severe damage. After the Korean War, many people turned to slash-and-burn agriculture in the mountains. After burning all vegetation, the farmers cultivated potatoes, maize, beans and other crops. In 1965, about 70 500 households (or 420 000 people) practised slash-and-burn cultivation on 40 000 ha of land; by 1973, 13 to 14 percent of all farmers were practising slash-and-burn agriculture on 125 000 ha of fields (National Archives of Korea, 2015). These farmers moved from one place to another, burning down trees and in the process destroying the litter layer and reducing soil fertility.



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5. Flooding after heavy rain in Hongchun, Gangwon Province, early 1970s

LARGE-SCALE CONVERSION OF FOREST LAND TO AGRICULTURAL LAND

When food shortage was serious, as a last resort it became necessary to convert forest land to farmland, because 64 percent of Korea’s land area was classified as forest land and some of this land was needed to plant more crops. Despite the government’s will to reforest the country, this conversion was imperative to solve the people’s hunger problem. The government enacted the Land Clearing Facilitation Act in 1962 and began large-scale clearing of forest land for cultivation of crops and vegetables, supported by President Chung-Hee Park’s statement that 1 ha of forest land could offer the potential for harvesting 3 600 kg of rice. Under this act, almost 146 000 ha of forest land were converted to agricultural land in the 1960s (Table 3). During this harsh time, the increased agricultural production achieved through land clearing greatly contributed to food security, but at the cost of the country’s forests.

Conversion of forests to agriculture continued into the 1970s. With impetus from the world food crisis of 1974 and a decrease in agricultural land due to urbanization, in 1975 the government enacted the Farmland Expansion and Development Promotion Act, which replaced the Land Clearing Facilitation Act and applied not only to forest land but also to other land categories such as land reclaimed from the sea. The Farmland Expansion and Development Promotion Act showed not only the government’s continuing will to solve the hunger problem, but also its efforts to introduce new techniques to increase agricultural land.

By the 1980s, with the forest rehabilitation under way, land clearing declined considerably (Table 3) and the focus shifted to enhancing agricultural productivity on existing cropland (Korea Rural Economic Institute, 1989). Only private land clearing is still carried out to some extent today.

Table 3. Conversion of forest land to agricultural land, 1960–1990

Period	Area (ha)
1960s	145 716
1970s	27 550
1980s	8 624
Total	181 890

Source: Korea Rural Economic Institute, 1989



3. FOREST REHABILITATION POLICY AND ACTIONS

Before the nation could rebuild, it had to rehabilitate its land and its agricultural productivity. In the mid 1950s, only 1.8 million tonnes of rice were harvested per year, a quantity insufficient to feed even half the population (Korea Rural Economic Institute, 1989), and the Korean Government had to depend on relief supplies from the United States of America. As one of the strategies for enhancing agricultural productivity, policy-makers developed a goal to rehabilitate Korea's forests so as to strengthen their watershed function and protect soil against flooding and drought. To ensure that forest rehabilitation would result in improved livelihoods as well as increased agricultural productivity, the government mainstreamed this goal into the First Five-Year Economic Development Plan.

The rehabilitation effectively began in the 1960s with the establishment of the Forest Law, enacted in 1961. As part of the forest rehabilitation effort, in 1962 the government enacted the Erosion Control Law and implemented the Erosion Control Project, which was often referred to as the Flour Erosion Control Project because the government compensated workers with flour (relief supplies from the United States of America) in lieu of wages. As food was scarce and poverty extreme, people were eager to participate in the project.

The government had a strong will to implement forest rehabilitation. It is said that President Park, flying over the Pohang/Yongil-Man area in 1964, was so

disturbed at looking down and seeing the land completely denuded that he swore to himself never to travel abroad again until the country became green once more. To oversee the greening of the country, the Korea Forest Service (KFS) was established in 1967.

However, because of the underlying poverty of the country, the forest rehabilitation did not go smoothly at the beginning. The budget for planting was small, and starving people continued to harvest trees illegally for survival, notably for fuelwood for cooking and heating – essentially planting trees with one hand and cutting them down with the other. People had planted trees to get a handful of flour, but even before

President Seung-man Lee knew that rehabilitation was essential, so he supported the 1950s rehabilitation project with keen interest. However, he could not establish any national policy. The government gave away a bowl of flour to people with the relief grains from the United States because there was no budget. People planted trees because of their circumstances, but they did not look after them.

– Kyung-Joon Lee, former Professor, Seoul National University, 11 April 2015

I was managing the erosion control project, living in Ham-pyeong for two months. We paid flour as wages during the later period of the project because of shortage of money. Women from the villages came up the mountain and begged me to let them participate in the project to get the flour. Living conditions were harsh, not to mention the extreme difficulties of getting a job back then.

– Ju-Seong Lee, former head of KFS Training Institute (Korean Broadcasting System, 2013)

the planted trees could properly spread roots, they disappeared into the furnace. The government’s will to rehabilitate the forest was futile when food was the most pressing issue.

FIRST TEN-YEAR FOREST REHABILITATION PLAN (1973–1978)

In 1972, a new political system was established that gave the president great legislative, administrative and judicial power. President Chung-Hee Park thus had the authority to impose his strong will for forest rehabilitation in the new government plans announced in January

1973. By March 1973, forest rehabilitation projects were given greater priority. KFS was transferred from the Ministry of Agriculture and Forestry (MAF) to the Ministry of Home Affairs (MOHA). The integration of forestry into the ministry responsible for local administration and the police force enabled the government to be more effective in mobilizing national capacity for forest rehabilitation.

The government aimed to reforest the entire nation within 20 years. The top-priority goal of the First Ten-Year Forest Rehabilitation Plan was to reforest 1 million hectares of the 2.64 million hectares of denuded forest land. As this goal was achieved in six years, the First Ten-Year Forest Rehabilitation Plan was successfully completed in 1978.

The key to the success of the forest rehabilitation effort was that it was a nationwide project that mobilized all available administrative power for its implementation. This meant that not only stakeholders such as government or



6. Promoting tree planting through a nationwide campaign; the text reads “Erosion control, let’s do it together!”



7. Postage stamp marking the national tree planting campaign; the text reads “Green will towards a rehabilitated Korea”



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8. Settlements for slash-and-burn farmers



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9. Slash-and-burn farmers moving to a village

mountain landowners, but all citizens, had to participate in forest rehabilitation. A national campaign (Photos 6 and 7) encouraged each village to reforest the area within a 2 km radius from the village centre, and organizations, schools and companies were responsible for reforesting designated areas. Tree planting was obligatory for private companies that owned mountain land. The awareness-raising campaign also emphasized that forest rehabilitation was vital to resolution of the food security problem. The nationwide tree planting effort reflected the government's commitment to rehabilitate forests in a short time by mobilizing central and local administrative power and law enforcement to the utmost.

Protection of existing forests was also a crucial factor in the rehabilitation. In an effort to eliminate the cause of deforestation, in 1966 the government enacted slash-and-burn farming regulations and in 1974 began to implement the Five-Year Slash-and-Burn Farming Regulation Plan to eradicate the practice. The government also paid 0.3 million slash-and-burn farmers to relocate (Photos 8 and 9). The initiative concluded successfully in 1978 with the eradication of all slash-and-burn agriculture.

In addition, the government engaged the police forces to control illegal forest harvesting and gave judicial power to forest officials to monitor deforestation activities. The adoption of a forest fire responsibility system made mayors or

governors responsible for forest fires in their jurisdiction. Furthermore, the government held a forest pest control conference and strengthened education on the importance of pest control in forest rehabilitation.

The government laid grounds in the Forest Law to establish a three-way profit-sharing system in which mountain landowners, forest workers (those who plant trees, run nurseries or tend plantations) and those paying the costs of reforestation could make a contract to build a forest cooperatively and divide the income from the forest in specified proportions.

During the First Ten-Year Forest Rehabilitation Plan, a total area of 1 079 773 ha was reforested nationwide (MSF, KSC and KDI, 2013).

SECOND TEN-YEAR FOREST REHABILITATION PLAN (1979–1987)

The Second Ten-Year Forest Rehabilitation Plan started in 1979 as the first plan finished four years earlier than was foreseen. By the time the second plan began, the people's living standard had improved through economic growth, and fuelwood had been replaced substantially by gas and coal. Moreover, massive urbanization had resulted in a much decreased rural use of fuelwood. The decline in fuelwood use contributed to the gradual recovery of the forests.

The goal of the second plan was to complete the reforestation of degraded lands that remained unfinished after the first plan. In the people's perception forest rehabilitation had already been successfully accomplished, so the second plan altered the focus to boosting forest resources and increasing the income of rural people. To this end, the emphasis shifted from total greening of the homeland to establishing commercial plantations; from increasing awareness for nationwide tree planting to disseminating technology; and from regulation-centred to development-centred forestry.

The second plan also continued to strengthen the campaign for nationwide tree planting to sustain people's participation. However, under the second plan the effort relied on voluntary participation rather than forced mobilization of labour. During the spring tree planting period (March to April), the government invited citizens to plant and tend trees voluntarily, while the central and local governments, villages and organizations designated certain sites for tree planting. In addition, the government declared the first Saturday of November as a tree-tending day and promoted national participation to raise awareness of the importance of tending trees after planting. Tree-tending projects were organized and implemented to connect planting and post-planting management. The government developed fertilizer for forests, distributed it free of charge and encouraged its application for three years after tree planting. In particular, the government adopted a system for evaluating the survival and rooting rates of each seedling. The system presented a fair evaluation of results and a basis for compensation, so it triggered competition and brought public attention to tree-tending.

The Second Ten-Year Forest Rehabilitation Plan achieved the rehabilitation goal one year earlier than planned, having reforested an additional area of 965 871 ha (MSF, KSC

and KDI, 2013). Thus in 1987 the great nationwide reforestation was complete (Figure 1). Moreover, under the second plan the 1 million hectares of planted forest created during the first plan were successfully managed.

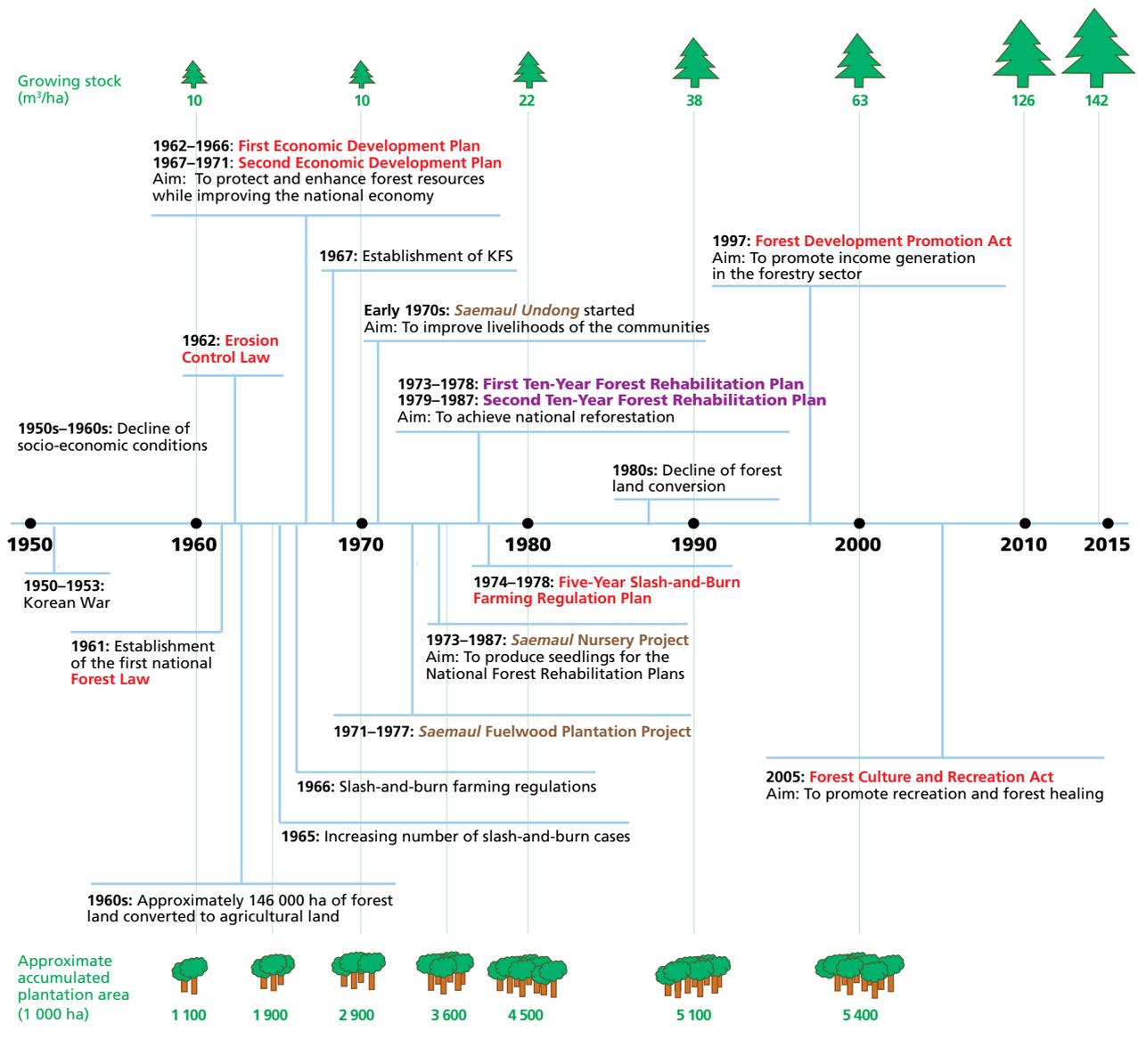
IMPLEMENTATION MECHANISMS FOR THE FOREST REHABILITATION PLANS

Integration of forest rehabilitation and the New Community Movement (*Saemaul Undong*)

Planting and tending trees is hard work, especially on mountain slopes where it can be done only by human power. To motivate people to participate in forest rehabilitation requires sufficient finance, technology support and personnel as well as an effective forest administration. However, at the beginning of the first ten-year plan, there was little awareness of these requisites, and the efforts tended to fail.

Around the same time, however, in the early 1970s, President Chung-Hee Park initiated the New Community Movement (*Saemaul Undong*), a community-based, integrated rural development programme. The objective of *Saemaul Undong* was to improve village conditions, introduce new attitudes and skills and raise income (Reed, 2010). Administered by MOHA, *Saemaul Undong* implemented small-scale self-help projects through village cooperation, with the motto "diligence, self-help and collaboration". Having an earnest desire to get out of poverty, people were more than eager to participate in building a wealthy village and embraced *Saemaul Undong*, working to embody the slogan "our village, with our hands". The adherence to *Saemaul Undong* exceeded expectations. The people developed confidence that they could improve their lives. With the positive response by villagers, the government recognized that *Saemaul Undong* provided a means for mobilizing attention to a

FIGURE 1. Timeline of forest rehabilitation

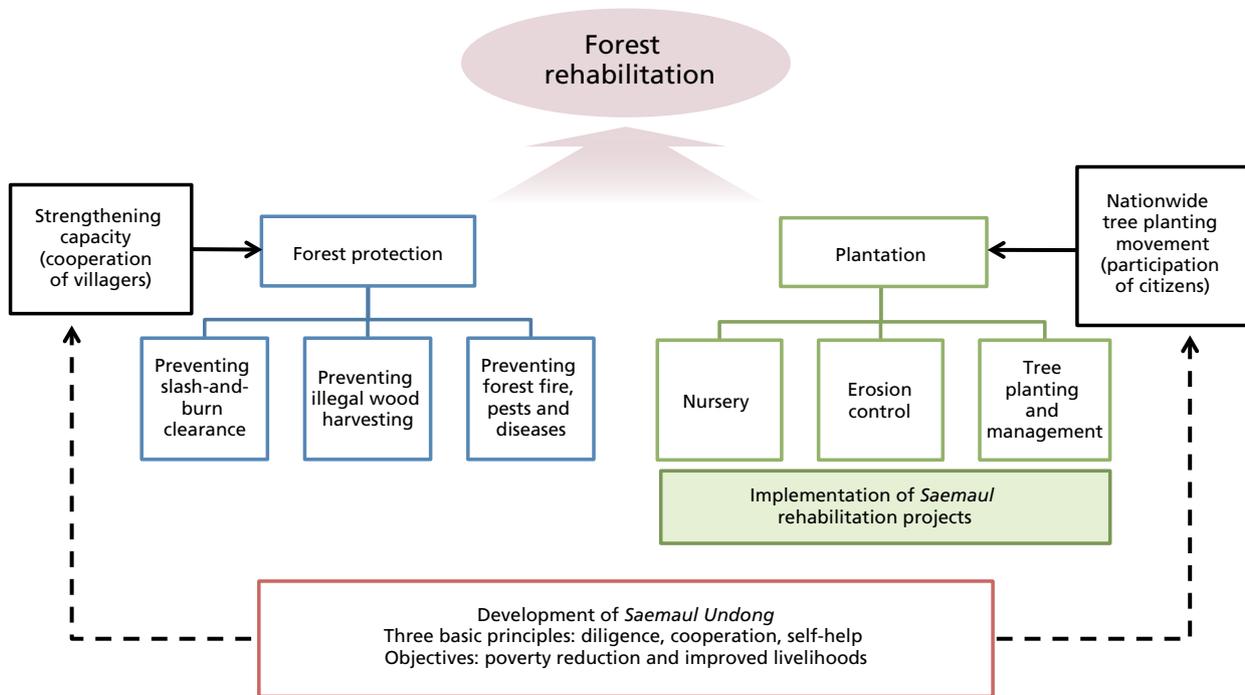


broad range of development policies and programmes, including industry (light and heavy) and infrastructure (modernization of highways, ports and railways). *Saemaul Undong* quickly spread nationwide.

After experiencing the vast potential of *Saemaul Undong*, the government established a policy to facilitate its use as a mechanism to overcome the difficulties of forest rehabilitation (Figure 2). Adopting *Saemaul Undong's* approach and values made it possible to implement

the Forest Rehabilitation Plans with the same authority and instilled in the participants the same sense of pride and commitment. Above all, integration with *Saemaul Undong* enabled the government to expand the reforestation effort to a nationwide scale. Tree planting for reforestation became popular throughout the country; men and women, students and soldiers, young people, old people and even children participated in tree planting (Photo 10).

FIGURE 2. Framework for integration of the New Community Movement (*Saemaul Undong*) in forest rehabilitation



10. Men and women of all ages and occupations participated in the nationwide tree planting programme in the 1970s

Saemaul Undong elicited participation in various ways. In some cases, one person per household was obliged to participate. Some activities, such as tree planting, were carried out voluntarily without wages. For much of the work, however, people were

paid for their labour. This employment provided a valuable opportunity to overcome food shortage, and provided an incentive for people to become involved.

Saemaul Undong contributed to the national reforestation plans not only by

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The daily payment [from participation in the reforestation process as part of the Saemaul movement] was high enough to attract people’s attention, encouraging their active participation, which contributed to household food security in the 1970s.

– Jin-Ha Kang, former collector of hayseeds, Yeong-Ju District, North Gyeongsang Province, 12 April 2015



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11. Saemaul Nursery Project

eliciting the participation and cooperation of villagers, but also through sophisticated community projects on nurseries, forest plantations, erosion control and fuelwood plantations. The industrial development and infrastructure established under *Saemaul Undong* also contributed to the success of the forest restoration. The modernized transport infrastructure, for example, facilitated distribution and supply of seedlings and delivery of human resources.

Community forest rehabilitation projects

New Community (*Saemaul*) projects were central to the success of the both the First and Second Forest Rehabilitation Plans. Their achievements are summarized here (from MSF, KSC and KDI, 2013) (Table 4).

The *Saemaul* Nursery Project (Photo 11) was implemented from 1973 to produce seedlings to supply the reforestation area. The government gave its full support to ensure income for the villages

Table 4. Achievements of the community (*Saemaul*) forest rehabilitation projects

Project focus	Characteristics	Achievements	
		First Ten-Year Rehabilitation Plan	Second Ten-Year Rehabilitation Plan
Nurseries	Provided village income from sale of seedlings	Accounted for 35% of seedlings produced	Accounted for 8.3% of the seedlings produced
Plantation	Voluntary participation without payment	Accounted for 44% of the total reforested area	Accounted for 39% of the total reforested area
Erosion control	Paid wages to participating villagers	Accounted for 71% of the erosion control activity in the country	Accounted for 20% of the erosion control activity in the country
Fuelwood plantation	Facilitated by IBRD loan	Achieved the goal (0.2 million hectares reforested) early (1977)	

Source: MSF, KSC and KDI, 2013



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12. **Saemaul Erosion Control Project**

involved. This project accounted for 35 percent of the total 2.7 billion seedlings produced during the First Ten-Year Forest Rehabilitation Plan (1973–1978); it was less active during the Second Ten-Year Forest Rehabilitation Plan (1979–1987), contributing only 8.3 percent of the seedlings.

The *Saemaul* Plantation Project was implemented by villagers on their own account, without any external payments. With the country’s weak financial situation, promoting self-motivated participation was key to the fast spread of the rehabilitation. The *Saemaul* Plantation Project played a critical part in recovering lost forest. It accounted for 44 percent of the total reforestation area during the First Ten-Year Forest Rehabilitation Plan and 39 percent during the second plan.

The *Saemaul* Erosion Control Project (Photo 12) was responsible for more than two-thirds (71 percent) of the erosion control activity in the country during the First Ten-Year Forest Rehabilitation Plan, when it was most operative; in that period it accounted for the interventions on 16 238 ha of the total 22 976 ha that underwent erosion control interventions. During the Second Ten-Year Forest Rehabilitation Plan, the project was responsible for 4 855 ha (20 percent) of

the 25 061 ha of erosion control work. This project could only have succeeded with the people’s participation. The spirit of diligence and cooperation promoted by *Saemaul Undong* greatly contributed to the project’s acceptance by villagers. Contrary to the earlier Flour Erosion Control Project, the *Saemaul* Erosion Control Project mostly paid wages to the participating villagers. Since increasing income was a fundamental goal of *Saemaul Undong*, this aspect of the project bolstered the movement.

The immense household use of fuelwood had been the main reason for the country’s forest degradation. In order to meet the fuelwood needs, KFS set a goal to reforest 200 000 ha specifically for fuelwood production purposes during the First Ten-Year Forest Rehabilitation Plan (Korea Forest Policy Society, 1975). The *Saemaul* Fuelwood Plantation Project,

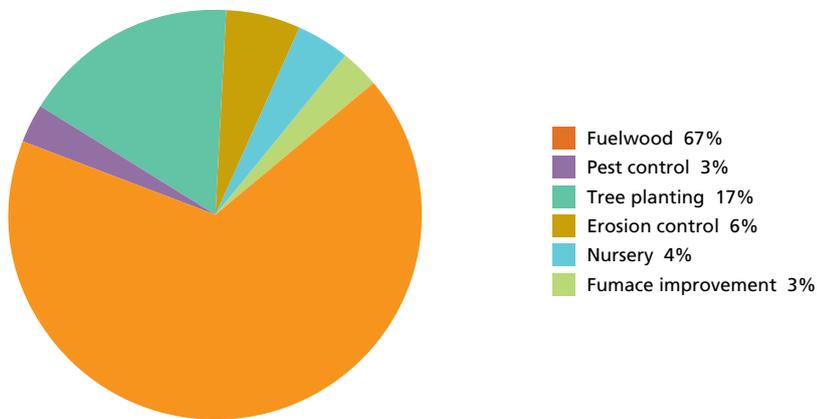
There used to be a bare mountain that was located on the border of North Gyeongsang Province and South Gyeongsang Province, which was frequently flooded. I was working for MOHA at that time, and one day, suddenly, the President ordered me on a special mission in the Saemaul department on erosion control projects. The mission was to work on the Dongdae mountain erosion control project, which KFS had been working on for over ten years. At the end of this time, it was evident that the communities residing in the Dongdae mountains were experiencing much less flooding and landslides thanks to the planted trees and well drained soils.

– Kun Goh, former Prime Minister, 11 April 2015

implemented from 1971 to 1977, greatly contributed to the fast recovery of forest by producing fuel in a timely way. In 1975, nearly 67 percent of the investment in various reforestation activities went into fuelwood plantation (Figure 3). The *Saemaul* Fuelwood Plantation Project was also based on the spirit of self-help,

encouraging villagers to look after their own forests. A loan from the International Bank for Reconstruction and Development (IBRD) enabled the project to achieve its goal before the target date. To date, the Republic of Korea is still the only developing country that has used an IBRD loan to plant trees.

FIGURE 3. Investment in various reforestation-related projects in 1975



Note: A total of KRW 36.2 billion was invested in reforestation in 1975, corresponding to USD 74.8 million at the exchange rate of USD 1 = KRW 484.

Source: Korea Saemaul Undong Center, 2013



4. IMPACT OF FOREST REHABILITATION ON FOOD SECURITY

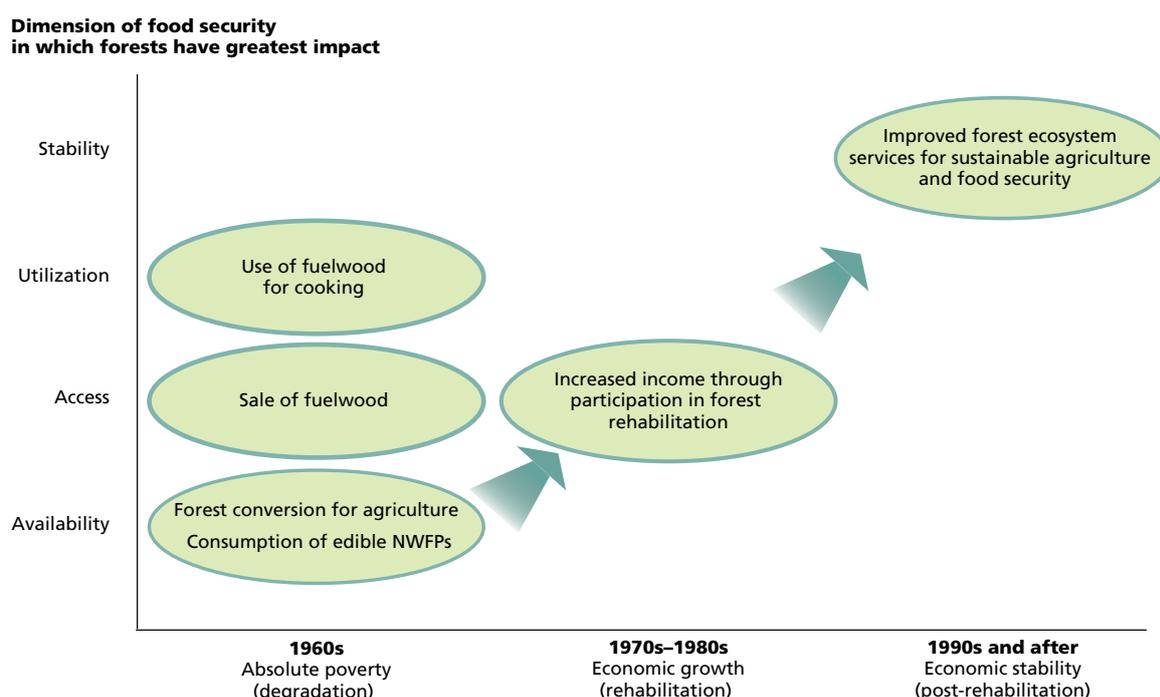
Forests have always played an important part in people's lives in the Republic of Korea. Early populations founded villages near sources of water at the foot of forested mountains, and developed cultures dependent on the forest. Forest foods such as wild edible plants, mushrooms and nuts contributed to their food security, both directly and indirectly (by generating income for people to buy food).

While forests have always had a role in all four dimensions of national food security, their contribution changed with

the forest rehabilitation and with national development and increased income levels (Figure 4). Before the 1970s, when food was extremely scarce, people depended on food obtained from the forests and on fuelwood to cook it, and they harvested timber, often illegally, in order to purchase food. Thus extreme deforestation put their food security in jeopardy.

During the forest rehabilitation period in the 1970s, nationwide forest rehabilitation projects enhanced people's income and their access to food. The government

FIGURE 4. Changes in the main roles of forests in food security



promoted planting of fruit- and nut-trees to address food shortage. The rehabilitated forests supported agricultural production through their environmental protection role, particularly in preventing erosion and reducing landslides and flooding. As shown in Table 5, the flooded area and number of victims decreased as growing stock increased.

By the time rehabilitation was completed in the late 1980s, conditions for agricultural production were more stable, the watershed role of forests in moderating water supply was enhanced, and forests were reestablished as a food security safety net in the event of flood or drought. The national income had increased so the role of forests in direct provision of food had become secondary at the national level, while their contributions to other aspects of food security had become more important. In a more prosperous society, the growing demand for forest recreation has created additional opportunities for communities in forest areas to generate income.

The following sections detail the contributions of the forest rehabilitation to each of the four dimensions of food security.

FOOD AVAILABILITY

Subsistence and food safety net

In the years after the Korean War, the food situation in the Republic of Korea was at its worst. Autumn harvests were insufficient

to carry people through the winter. In most parts of the country, barley, a substitute for rice, was planted in winter and harvested in early summer. Thus spring was a time of great hardship for farmers; year after year people died of starvation when winter food stocks became depleted. This period was called the “barley hump” (*borit gogae*), as people had to survive until the barley could be harvested.

In this desperate time, people turned to the mountain forests. Many households survived on roots and bark. In spring, people gathered wild edible plants such as mugwort and shepherd’s purse to make porridge. The bark of pine trees was also used to make porridge, as well as rice cakes (*tteok*). Because of the high level of tannin in pine tree bark, these products caused severe constipation. This food situation was resolved with the development of the new high-yielding Tongil rice variety in the 1970s and with the country’s economic development.

Edible non-wood forest products

Except during the period when forest lands were totally denuded in the 1950s and early 1960s, NWFPs such as wild edible plants and mushrooms were food resources that people could easily find on forest land when they were short of food. They became a basic component of local diets, and remained popular even as the economy became more prosperous. Until the 1960s, there was

Table 5. Growing stock, flooded area and victims of floods and typhoons, 1960–2010

Decade	Average growing stock (m^3/ha)	Flooded area (ha)	Victims of floods and typhoons
1960s	9	100 519	162 114
1970s	14	68 866	118 420
1980s	28	111 990	98 566
1990s	48	60 493	37 184
2000s	82	31 568	20 264

Source: KFS, 2015; Ministry of Public Safety and Security, 2014

no market demand for NWFPs; they were consumed directly by the gatherers.

As one of the solutions to food shortage the government promoted planting of fruit- and nut-trees such as persimmon (*Diospyros kaki*) and especially chestnut (*Castanea crenata*) along with the forest species (*Pinus rigida*, *Pinus koraiensis*, *Robinia pseudoacacia*, *Alnus firma* and others) (Korea Forest Policy Society, 1975). After 1973, chestnut trees were planted on a large scale as part of the reforestation programme. In 1985, the year of the largest volume of harvest throughout the two forest rehabilitation plans, 5 511 tonnes of chestnuts were produced (MSF, KSC and KDI, 2013).

As people's income increased and the economy expanded through the 1980s, the market demand for NWFPs rose as the urban population increased and the economy grew. It became difficult to meet the demand just through harvesting from forests. At the same time, the environmental conditions had become less favourable for the growth of some NWFPs as forests became denser through rehabilitation. As a result, people started to cultivate various NWFPs on mountain lands. The production of seeds, nuts, mushrooms and especially edible wild plants has been on an upward trend (Table 6).

Starting in the 1970s, chestnuts from forest plantations and forest foods such as mushrooms, wild vegetables and other edible wild plants greatly helped to solve the shortage of food for 30 million people.

– Kyung-Joon Lee, former Professor of Seoul National University, 11 April 2015

ACCESS TO FOOD

Harvest and sale of wood and non-wood forest products

Even in the 1950s, when incomes were low and poverty was extreme, market sales of forest products always had a role in supporting food security. At the national level, the value of forest products increased from USD 38 million in 1960 to nearly USD 8.8 billion in 1990 and to USD 15.4 billion in 2010. Although the contribution of forest products to the national GDP declined from approximately 2 percent in the 1970s to below 1 percent in the 1990s, their absolute value has continued to increase (Figure 5).

Until the 1960s, fuelwood was an essential resource for most people and

Table 6. Annual domestic production of non-wood forest products, 1990–2010 (tonnes)

Items	1990	1995	2000	2005	2010
Nuts					
Chestnut	85 043	93 655	92 844	76 447	68 630
Walnut	906	1 311	1 079	868	1 061
Pine nut	868	1 084	1 233	2 630	6 720
Ginkgo nut	652	774	1 076	1 552	2 434
Mushrooms					
Pine mushroom	945	654	536	724	729
Oak mushroom	1 648	2 824	4 722	5 463	5 654
Edible wild plants	9 534	18 498	25 591	33 271	47 755

Source: Korea Rural Economic Institute, 1960–2013

always in demand. Villagers, including children, collected and sold fuelwood and forest litter and bought food at the market with the money earned.

During the forest rehabilitation, harvesting for fuelwood was permitted in some planted forests. When villagers (at least one person from each household) were required to participate in tree planting, the households were compensated not only with cash, but also with permission to collect fuelwood in designated fuelwood forests twice a year. Thus fuelwood continued to be a source of income for some villagers.

Harvesting for timber was (and is) strictly regulated, but in certain circumstances owners of private forest land were able to obtain permits from KFS to harvest timber as a source of cash.

During the rehabilitation period, the marketing of both naturally harvested and cultivated NWFPs also continued to be a source of income (Photo 13). Income generated through NWFPs (chestnut, oak leaves, *Smilax* leaves, chipmunks [exported as pets], turf seeds, oak bark and vine bark) through *Saemaul Undong* forest rehabilitation activities, for example, increased steadily from 1969 to 1987 (Figure 6).



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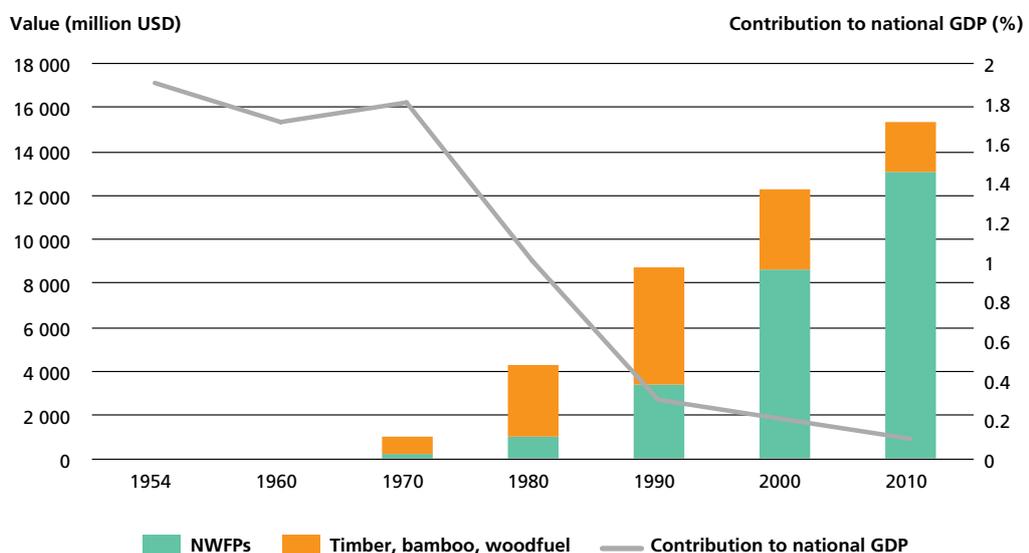
13. Cooperative work of feeding silkworms for village income generation

Income from planting fruit- and nut-trees: the case of chestnut

Chestnut was planted in 1968 as part of the government's Income Generation Programme for Farmers and Fishermen, but gained in importance under the forest rehabilitation programme as one of the most important species for reforestation (MSF, KSC and KDI, 2013). Chestnut trees were mostly planted and tended by private forest owners, but they were also planted by villagers as part of *Saemaul Undong* projects to raise village funds (see Box).

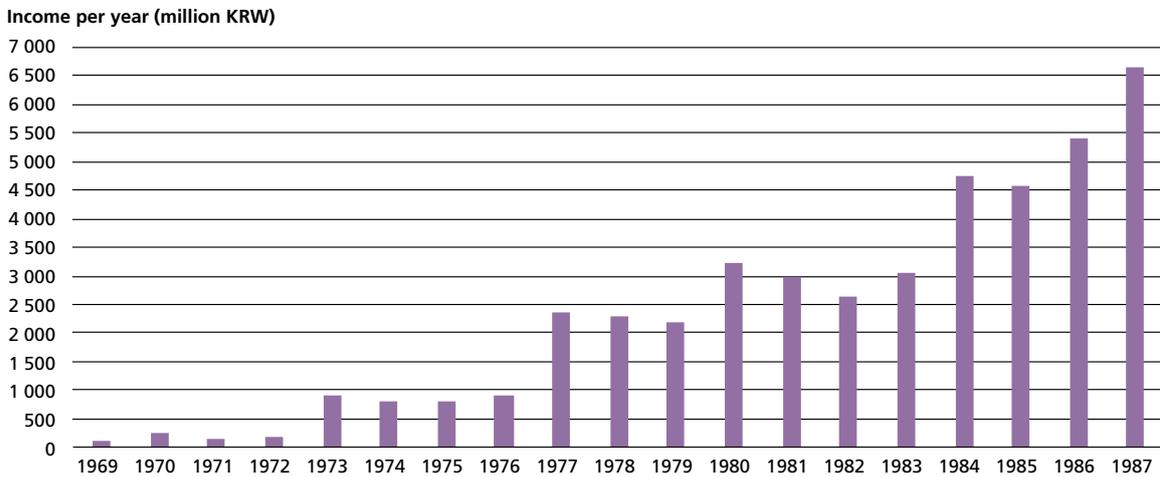
Planting, tending and harvesting chestnut trees (Photo 14) generated a large amount

FIGURE 5. Change in value of forest products, 1954–2010



Source: Bank of Korea, 2015

FIGURE 6. Income generated from NWFPs through *Saemaul Undong* forest rehabilitation activities, 1969–1987



Note: The currency exchange rate increased steadily over time, from USD 1 = KRW 316.65 in 1971 to USD 1 = KRW 860.80 in 1987.
 Source: Korea Saemaul Undong Center, 2013

of income. In 1976, 234 tonnes of chestnuts sold at agricultural cooperative markets generated about 93.8 million Korean won (KRW) (USD 194 000) of income, accounting for 10 percent of total income earned from NWFPs. In 1987, at the end of the Second Ten-Year Forest Rehabilitation Plan, chestnut generated about KRW 5.2 billion (USD 6.3 million), which was 78 percent of the total income from NWFPs. Chestnut also provided notable export income, which rose from

USD 1 400 in 1979 to USD 190 million in 1994, giving chestnut the highest export value of any single item (MSF, KSC and KDI, 2013).

Income generation from participation in forest rehabilitation projects

Within the forest rehabilitation effort, large-scale projects generated income for villagers. At the beginning of forest rehabilitation, the government paid a bowl of flour as wages because of its severe financial constraints. Since a bowl of flour was rare at the time, people actively participated in the projects to feed their families.



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14. People harvesting chestnuts together at a cooperative village chestnut tree plantation in Namwon, Jeollabuk Province – a source of income, augmenting access to food

Securing forest resources led to increased income which eventually improved the living standard of farm households. Thus people were able to purchase and consume various types of food, including meat, fruits and vegetables.

– Young-Sik Seo, former *Saemaul* instructor, Gwangyang District, Jeonnam Province, 18 April 2015

After implementation of the rehabilitation began in earnest, wages were mostly paid in cash. The community nursery, erosion control, planting and tending projects created jobs and revitalized the rural economy through paid wages, enabling people to buy food.

Compound income projects made it possible to multiply the income earned from forest rehabilitation projects. In this strategy of *Saemaul Undong*, villages would save 50 percent of the income generated from a project in a trust fund for future village development projects and divide the rest equally among the participants (Photo 15). In the next project the process would be repeated. Many *Saemaul Undong* initiatives were carried out in this way, including chestnut, cattle and mushroom production.

The *Saemaul* Nursery Project, for example, was run as a compound income project. The government loaned villages funds at zero interest to rent land and buy materials, seeds, fertilizers and pesticides. The government then bought all seedlings produced by the village nurseries at market value. The income generated was divided between villagers and a village trust fund. In 1973, the first year of the project, the villages generated a total of KRW 860 million, or KRW 66 000 (USD 165) per village,



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15. Awarding funds to the village trust fund of an exemplary *Saemaul* village in 1972

from the nurseries. The income went up to USD 1 411 per village in 1977, and the average annual income from 1973 to 1988 was USD 474 per village (based on the 1988 exchange rate) (MSF, KSC and KDI, 2013). In addition, since mostly fast-growing and fruit- or nut-producing trees were planted, villages were able to earn additional money from forest products such as wood and chestnuts. For example, one village of Pyeongtaek City in Gyeonggi Province began a community nursery project in 1974 which raised 52 500 *Castanea crenata*, 11 000 *Robinia pseudoacacia*, 43 600 *Lespedeza bicolor* and 3 300 *Populus euramericana* seedlings. The

Box

A village group raises income by planting chestnut

In 1970, Young-Sik Seo obtained over KRW 2.3 million (USD 7 406), a considerable amount of income, from his 9 ha of chestnut plantation. He had developed the plantation on degraded sloping forest land after selling his 1.3-ha rice field in the small hope of freeing himself from poverty. At that time, people in his village thought that planting

chestnut was a ridiculous idea because the concept was new and seemed risky. However, people who witnessed his success were motivated to try planting chestnut on a larger scale. The village organized a chestnut group and planted 130 ha of chestnut trees on their 331 ha of field and forest land. Each household in the village now earns KRW 450 000 (about USD 450)

per year from 0.7 ha. “The entire process of cultivating chestnut trees, from planting to harvest, can be done in the agricultural off-season and by using idle labour. Therefore it is suitable as a source of extra income for farm households”, Mr Seo said.

Source: Interview with Young-Sik Seo, *Saemaul* instructor in Gwangyang District, Jeonnam Province, 18 April 2015

village sold the seedlings for KRW 1.3 million (USD 3 300). After deducting investment money, the village earned KRW 1.1 million (USD 2 800) (interview with Seung-dae Park, village leader in Pyeongtaek District, Gyeonggi Province, 10 April 2015).

Income generation from recreational forests

In recent years, thanks to social development and the increase in national income, a growing number of people are able to enjoy their leisure time. Moreover, when the five-day workweek was promoted in mid-2000 (freeing up weekends, which were previously working days for the majority of Koreans), people in urban areas started to spend more time and money in forests for recreational and therapeutic purposes. For example, according to a national survey of 1 700 people, about 15 million people (one out of three of the entire population over the age of 13) climb or hike in the forests at least once a month (Korea Gallup, 2015).

The increased demand for forest recreation provides various opportunities for communities in mountain areas to generate income. For every 50 000 visitors to mountain national parks, 53 hired rangers are needed, and regional economic development worth USD 4 million is generated (KFS, 2013). Local communities can generate income by providing recreational infrastructure and accommodation for visitors. Forest recreation or ecotourism often offers opportunities for



16. Forest recreation provides opportunities for local income generation: visitors at Mount Jiri, Jeollanam Province



17. An environmental education programme for youth

sale of forest products, providing additional opportunities to create income. For example, Mount Jiri in Jeollanam Province has 274 km of hiking trails crossing 117 villages. Every year 400 000 visitors generate USD 32 million, including income for more than 420 local employees (Photo 16). The sale of local forest products and provision of accommodation on Mount Jiri generated USD 2 770 income per household in 2011 (KFS, 2013). Another example is a specialized village for therapy for atopic skin disease, opened in 2001 at Myungdal-ri in Yangpyung. The village is surrounded by Korean pine (*Pinus koraiensis*), whose extracts are traditionally known as a cure for atopic dermatitis. In 2012, annual income per household was about USD 50 000 from accommodation, educational programmes and activities provided for youth and students (Photo 17) and direct trading of agricultural and forest products (KFS, 2013).

FOOD UTILIZATION

Fuelwood for cooking

Energy for cooking is required for utilization of food.

After the Korean War, with suspended coal supply from the north, the Republic of Korea had to depend solely on fuelwood for energy (Photo 18). In 1955, the country used about 10 million cubic metres of wood



© Korea Forest Service

18. In the years following the Korean War, the Republic of Korea depended solely on fuelwood for energy

for household fuel, which accounted for 17 percent of annual growing stock (Bae and Lee, 2006). However, the severe deforestation resulted in fuelwood shortage. Existing fuelwood plantations, which had been established with government support right after independence in 1948, were limited and could not supply enough fuelwood to meet the demand. In 1959, the government estimated that 2.34 million households in rural areas around the country needed 1.17 million hectares of fuelwood plantations (0.5 ha per household), but only 430 000 ha had been established. In 1967, the year that KFS was established, the government established 370 000 ha of fuelwood plantations (accounting for about 80 percent of the total area reforested that year, 450 000 ha). In 1975, planting of fast-growing trees, including *Robinia pseudoacacia* and *Alnus firma*, accounted for 45 percent of total reforested area and 67 percent of total fuelwood plantations established up to that time (MSF, KSC and KDI, 2013). Throughout the 1960s fuelwood remained the major energy source in rural areas.

However, the government discouraged the use of fuelwood in urban areas. In 1958 the flow of fuelwood to urban areas was prohibited (KFS, 2014b), and the government began to distribute coal briquettes as an alternative energy source, especially in urban areas where households could afford them because of their increased incomes. In 1970,

when urban areas accounted for more than 50 percent of the total population (Statistics Korea, 2015b), only 7 percent of the urban population used fuelwood (KFS, 2014b).

In the 1970s alternative energy sources such as coal briquettes and gas were introduced in rural areas as well, which naturally led to a decrease in fuelwood consumption. The purchase of coal briquettes, made possible through economic development, was also a time saver: In the early 1960s, a fuelwood collector had to labour all day barely to fill two carriers, and this supply would only last for three to four days. In contrast, after 1970, with one day of wages it became possible to buy 25 coal briquettes, i.e. one week of fuel (KFS, 2014a).

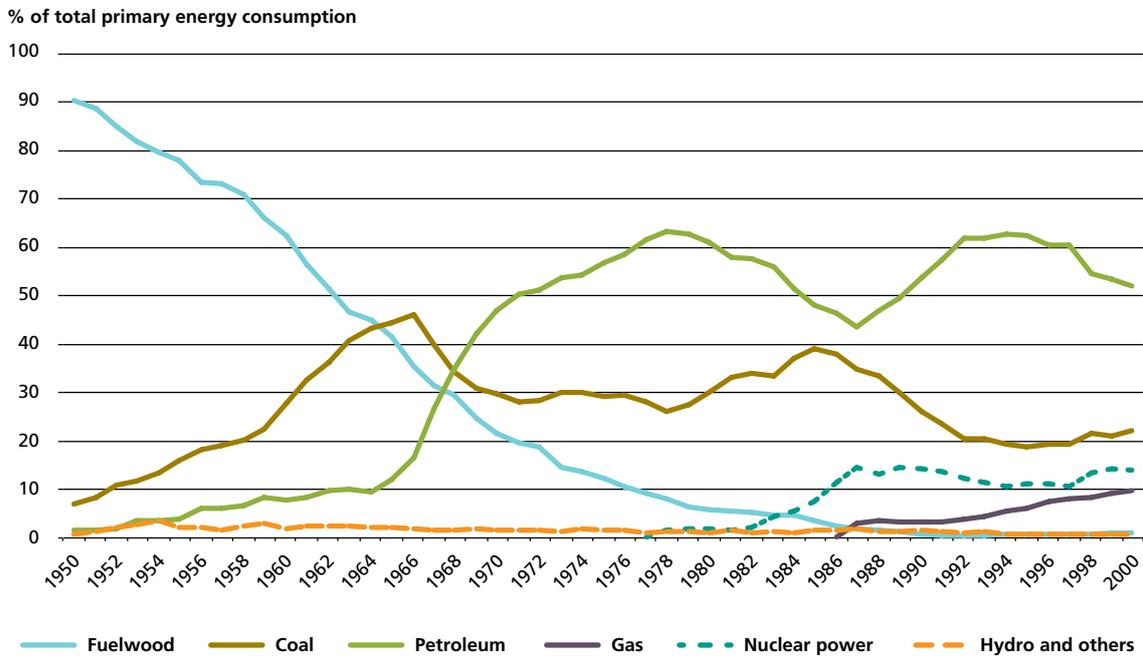
In 1972, 2.8 million households were still using fuelwood (MSF, KSC and KDI, 2013). However, the share of fuelwood in primary energy consumption, which had been 90 percent in the early 1950s, dropped below 10 percent in 1977 (Bae, Joo and Kim, 2012) (Figure 7). Indeed by the end of the 1970s few households depended on fuelwood for cooking and heating, and government policy no longer promoted planting for fuelwood.

With a secure energy supply, rural people began to use refrigerators and rice cookers, which enabled them to store and cook food in a more sanitary manner and also saved women time from household chores. Thus the contribution of fuelwood to the food utilization aspect of food security declined sharply. However, the drop in the use of fuelwood enhanced the role of forests in the stability aspect of food security, by contributing to forest conservation.

Clean water supply

The mountain forests also contributed to food utilization by enabling the provision of pure water to villages for cooking and other uses. The government placed provision of safe drinking-water high on the agenda of rural livelihood improvement. In 2013, it was estimated that forested watersheds in the Republic of Korea supplied over 19.2 billion tonnes of water, which is about three times

FIGURE 7. Changes in primary energy consumption in the Republic of Korea, 1950–2000



Source: Bae, Joo and Kim, 2012

more than the potential water supply from watersheds without forest cover (KFS, 2013).

In the 1960s and early 1970s, in rural areas lacking household water supply systems, people had to go to public wells to fetch their drinking and cooking water. However, owing to a lack of understanding of water sanitation, groundwater – the main source of drinking water – became contaminated because sewers and lavatory systems got flooded during heavy rains, posing a serious hygiene threat. Waterborne diseases occurred frequently.

Under *Saemaul Undong*, a small-scale water supply project was implemented to deliver uncontaminated water to each household from the mountains, where it was naturally purified by rehabilitated forests. Up to 1980, water supply was established in 28 130 villages, 86 percent of the total of 32 624 villages in rural areas (MSF, KSC and KDI, 2013). Each village was responsible for managing the water supply system once it was set up.

In 2010, the value of public benefits from water quality improvement attributed to

forests was estimated at USD 16 billion, and the value of forests’ water filtering services was estimated at USD 5.5 billion (KFS, 2013).

Provision of food energy, nutrients and dietary diversity

Increases in the production of forest products through forest rehabilitation had a positive effect on people’s nutrition. The average daily intake of food energy per capita increased 40 percent from 2 218 kcal in 1962 to 3 056 kcal in 2013 (Korea Rural Economic Institute, 1960–2013). From the early 1970s, the production of nuts (chestnuts, pine nuts, walnuts and ginkgo nuts) increased sharply, and the food energy from nut consumption relative to total food energy consumed rose 15 times between 1974 and 2013 as a result of nut-tree plantations established in the 1960s (Figure 8). In 2012, nuts provided 1.3 percent of total fat consumed as well as other nutrients including calcium (0.60 percent), iron (0.64 percent) and various vitamins on a daily basis (Korea Rural Economic Institute, 1960–2013).

Prior to the rehabilitation programme and *Saemaul Undong*, people mostly consumed carbohydrates such as cereals, potatoes and pulses to satisfy their hunger. In recent years, increased income has allowed people to enjoy more balanced diets including various cultivated edible NWFPs, which offer a variety of micronutrients (e.g. calcium, iron, vitamin A) as well as macronutrients (e.g. protein, fat, carbohydrates) that would be lacking in carbohydrate-based diets.

STABILITY OF FOOD SECURITY

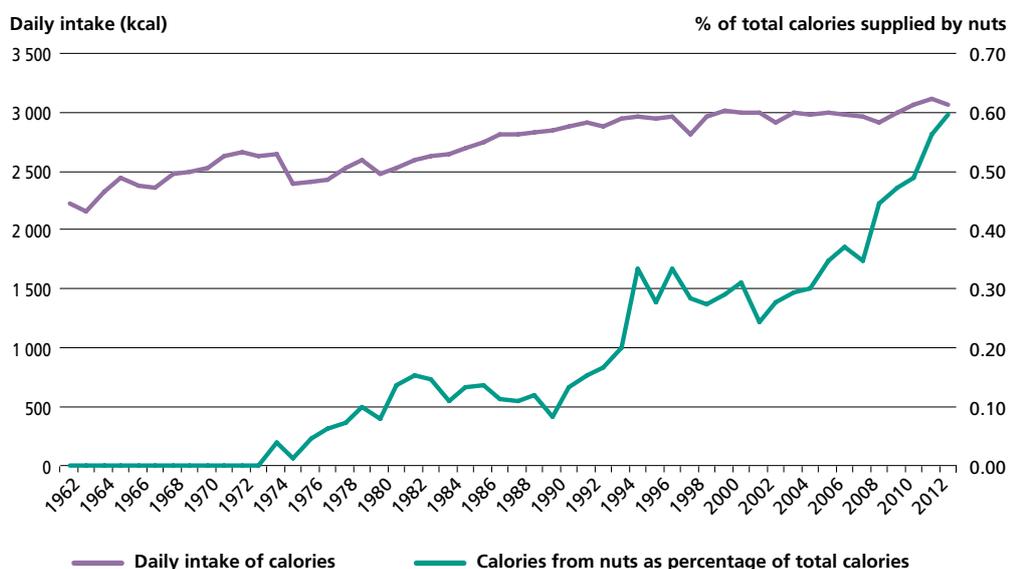
The importance of forests in the stability of food security is related to their roles in providing a safety net and in sustaining a healthy environment conducive to sustainable food production. Forests contribute to increased agricultural production and productivity by protecting farmland, preventing soil erosion and flood damage, maintaining soil fertility, regulating water supply, supporting biodiversity and mitigating climate change.

At the global level, much discussion has focused on the direct or indirect effect of forests on agricultural productivity.

The Republic of Korea was able to solve its chronic hunger issues by increasing its agricultural productivity by 250 percent during the period 1950–1980 (MAF, 1999). This increased agricultural productivity was due to the use of fertilizers, new high-yielding crop varieties, farm machinery and other inputs, but an additional factor was the rehabilitated forests' contribution, in particular, to water resources conservation. Since more than a half of the annual rainfall is concentrated during the summer rice growing season, a stable water supply for spring transplanting is critical for a successful rice harvest.

Forest watershed conservation capacity recovered rapidly with the completion of the forest rehabilitation plans in the late 1980s. In 2013, the total amount of water conserved in the forest areas was estimated to be around 19.2 billion tonnes (KFS, 2013), which exceeds the aggregated capacity of 49 major reservoirs (14 billion tonnes in 2006) (KFRI, 2012). A study showed that right after the implementation of the rehabilitation plans, water flowed in streams only during the three summer months, but 30 years later, in the 2000s, water was flowing all year. In

FIGURE 8. Daily intake of calories and the ratio of nuts to total calories, 1962–2013



Source: Korea Rural Economic Institute, 1960–2013

addition, the rate of flow during the dry season was found to be four times higher in the 2000s than the 1990s (KFS, 2014a).

SUMMARY: CHANGES IN FORESTS' CONTRIBUTION TO FOOD SECURITY

As seen in the previous sections, the role of forests in the four dimensions of food security has changed over time, with their main contribution shifting from availability and utilization to access and then to stability (Table 7). Until the 1960s, during the time of absolute poverty, forests primarily had a role in food availability and in food utilization through the use of fuelwood for cooking. With accelerated economic growth and the implementation of rehabilitation projects, the food access aspect of food security gained importance, as income earned from participating in rehabilitation activities greatly contributed to solving food problems. In addition, the role of forests in providing clean drinking-water supported the utilization aspect of food security. With

There were some problems in food production due to water scarcity. But after reforestation, water became more available for drinking and agriculture. Thus reforestation helped the villages to stabilize food production.

– Heon-Pal Moon, former researcher on food production, Youngil District, North Gyeongsang Province, 10 April 2015

complete rehabilitation of the forests, their main role in food security became erosion control and watershed protection, which helped improve and stabilize agricultural productivity. Today, in a prosperous society, the demand for the recreational, rest and healing functions of forests is increasing rapidly, especially among the urban population, and the demand for related services creates employment among the rural population, which contributes to rural income and food security.

Table 7. Contribution of forest rehabilitation to the four dimensions of food security

Dimension	Prior to forest rehabilitation (before 1970s)	During forest rehabilitation (1970s to early 1980s)	After forest rehabilitation (late 1980s and after)
Food availability	Wild plants consumed for survival; availability jeopardized by rampant deforestation	Fruit- and nut-tree plantation (especially chestnut)	Expanded production of forest products (mushrooms, edible and medicinal plants)
Access to food	Income from harvesting and selling wood	Production, collection and sale of forest products (wild edible plants, mushrooms, medicinal plants, nuts) Participation in forest rehabilitation projects for income	Income generation from recreational use of forests
Utilization	Fuelwood for cooking Nutrients provided by forest foods	Fuelwood substituted by other cooking fuels Provision of clean water through watershed rehabilitation	Forest foods as a source of dietary diversity
Stability	Severe damage to agricultural production from frequent landslides and floods	Stability of agricultural production enhanced by protective role of forests (e.g. erosion control, climate change mitigation)	Greatly improved conditions for agricultural production with enhanced forest ecosystem services



5. LESSONS LEARNED: food security through forest rehabilitation and sustainable forest management

As this study has shown, the experience in the Republic of Korea demonstrates not only that forest rehabilitation and food security can go hand in hand, but that their integration is essential. Both forests and food security can be enhanced if four prerequisites are met:

- an integrated approach to ensure that all relevant sectors work towards the same goals and not at cross-purposes;
- people's participation and opportunities for them to benefit;
- strong leadership to create the necessary framework, infrastructure, motivation and will;
- holistic economic development.

In short, the success of the forest rehabilitation and its ability to have a positive impact on food security rested on effective policy and leadership, resulting in cooperation of the government and the citizens.

Although some of the food security successes achieved through the Republic of Korea's forest rehabilitation were unplanned, lessons from this experience can provide inspiration for other developing countries desiring to incorporate food security goals in forest rehabilitation policy.

INTEGRATED APPROACH TO FOREST REHABILITATION

Completing reforestation over a short period was not a simple task when half the mountain areas were deforested.

The forest rehabilitation effort was a puzzle comprising numerous strategies in various fields. To harmonize every aspect in a synergistic manner, a comprehensive system was required, embracing both infrastructure and enabling conditions for mobilizing human and physical resources (Table 8).

The government expanded forest administrative bodies and strengthened their ability to create a foundation for national tree planting. It transferred KFS, which belonged to MAF at the time, to MOHA, which held provincial administrative power and law enforcement responsibilities; it established forest departments to oversee the relevant matters in cities and provinces, and forest divisions in cities and districts. This transfer allowed effective intersectoral collaboration at the government level. In addition, the government obtained a loan from IBRD to expand finances for rehabilitation.

Above all, the government developed an integrated policy in which a key strategy for creating an enabling environment was harmonization with the New Community Movement, *Saemaul Undong*. The movement was a mechanism for attracting nationwide public attention and energy and motivating people to participate in rehabilitation. These factors contributed to the achievement of the goals of the forest rehabilitation ahead of schedule.

Table 8. Integrated pieces of a successful rehabilitation strategy

Components	Legal and institutional aspects	Implementation aspects
Seedling production	Involving forest communities	Supporting seedlings (government purchase of entire quantity) Adopting village nursery projects Affiliating with <i>Saemaul Undong</i> income project
Erosion control project	Enacting Erosion Control Law Delegation of authority to municipal and provincial organizations Securing government budget (managing special accounts)	Implemented as a government-led project (paid labour) Affiliating with <i>Saemaul Undong</i>
Tree planting project	Establishing forest profit-sharing system (in the Forest Law) Expansion of Korea Forest Service	Adopting national tree planting project (government) Affiliating with <i>Saemaul Undong</i> Implemented with IBRD loan
Tree-tending	Designating tree-tending day	Development and free distribution of fertilizer Strengthening post-planting management (tree inspection) Affiliating with <i>Saemaul Undong</i>
Forest protection	Ban on mountain climbing Enacting Slash-and-Burn Fields Act Mobilizing police power and giving judicial power to forest civil servants	Controlling illegal forest harvesting and ban on mountain climbing Preventing insect pests Implementing forest fire responsibility system Controlling deforestation and promotional campaign for tree planting

MOBILIZING PEOPLE

The forest rehabilitation would have been impossible if there had not been the will to move mountains, and it would not have contributed to food security so successfully if the people's involvement and benefits

had not been part of the objective and the strategy. The rehabilitation programme was widely seen as necessary, but creating the motivation to participate was a challenge as poverty was still the most urgent matter at the time.

Saemaul Undong played a huge part in the success achieved over a mere 20 years. Advocating diligence, self-help and a cooperative spirit, it created the social atmosphere for active and voluntary participation of citizens in forest rehabilitation projects. With its slogan "We can also live better", it raised people's confidence that participating in reforestation activities would improve their standard of living and their food security. Wage employment provided under the programme served as an incentive for people to become involved and helped them overcome food shortage.

Forest rehabilitation projects provided job opportunities for people. Villagers provided not only labour for the projects,

People participating in the rehabilitation project applied fertilizer and compost with their bare hands and dug holes for trees... they cared for the planted trees from their hearts. It was a history made possible only through this heartfelt commitment: a history of bare hands and dedicated hearts. Also, it was when people were hungry, so you can say it was a history of pain that overcame hunger.

– Jong-Cheol Kim, former Head of Korea Forest Newspaper (Korean Broadcasting System, 2013)

but also services such as accommodation for workers from other regions. The food, wages or income provided meals and helped them overcome hunger. Previously, the rural economy had not been able to progress away from a subsistence economy in which money ran out after the rice harvest in the autumn. The rehabilitation projects were a source of income that brought vitality to the rural economy and supported the livelihood of citizens.

STRONG LEADERSHIP

To harmonize the many interconnected strategies integrated in the rehabilitation policy, committed leadership at the top is more important than any other factor. It would not have been possible to achieve the active participation of the whole nation and to execute the rehabilitation strategies and policies as intended without the president's active interest and leadership, and without a well-organized system of command to administer the extensive rehabilitation system, encompassing the central and local governments and the public. Strong and competent leadership was required to develop mutual cooperation among many actors in different fields and at different stages of work.

President Chung-Hee Park, during his 16-year term from 1963 to 1979, had a strong will to promote rapid reforestation and prioritized forest rehabilitation as one of the most important government agendas. The government was determined that planting trees was the best way to save the degraded territory and to eradicate poverty. President Park always showed his active leadership by observing the status of project implementation carefully, grasping problems and suggesting solutions. Whenever he visited a forest rehabilitation area, he questioned the participants directly and tried to solve any problems by assigning the relevant people right away. In addition, the president thought that the rehabilitation

In the past when people were poor, participating in the erosion control project helped improve their livelihoods since they were paid for their labour. As most villagers joined the project, cash began to flow and livelihoods became a lot better. Besides, during the erosion control work, many technicians came to the village from outside and lived together for two to three months. In my case, I offered accommodation and meals to around 10 to 17 people. From that revenue, I repaired the roofs of my house.

– Interview with villager in Bonghwa District, Kyeongbuk Province, 11 April 2015

must be supported by strong executive power to achieve the desired results, and for this reason transferred KFS from MAF to MOHA, which oversees provincial administration and the police force.

HOLISTIC ECONOMIC AND SOCIAL DEVELOPMENT APPROACH

The Republic of Korea's forest rehabilitation took place in a milieu of rapid economic and social development. The nominal GDP was USD 1.1 billion in 1953; by 1987 it had increased 108 times (Statistics Korea, 2015a). The government approached forest rehabilitation as an integral part of its economic development strategy. One example of this holistic approach to development was the integration of forest rehabilitation in community development (through *Saemaul Undong*, the New Community Movement). Another was the reduction of fuelwood use – and thus deforestation related to illegal fuelwood harvesting – through the introduction of more modern energy sources (accelerated by social changes including increased rural-to-urban migration).



6. CONCLUSION

In the Republic of Korea, people's lives have always been closely connected to forests. Today, with 80 percent urbanization amid rapid industrialization, people continue to maintain a close relation with forests.

The findings of this study affirm that forests have played a vital role in achieving national food security in multiple ways through different stages of the country's development. Before and throughout the forest rehabilitation, and still today, forests have had various significant roles in the four dimensions of food security, but with the increasing income of the developing society, their main role has changed over time. Before the rehabilitation forests primarily had a role in food availability (forest foods) and food utilization (fuelwood for cooking). The rehabilitation activities enhanced food access (income to purchase food) and food utilization (clean water supply, provision of micronutrients). With the completion of the forest rehabilitation and the rapid economic development of the country, forests have come to play a greater part in ensuring the stability of food security (erosion control, watershed conservation, climate change mitigation, improved and stabilized agricultural productivity and production).

Today, with per capita GDP approaching USD 30 000 (Statistics Korea, 2015a), the demand for the recreational, rest and healing function of forests is increasing rapidly, especially among the urban population, and the related services offered by rural populations contribute to their income and food security.

While this study has shown the important role of forests in food security in the Republic of Korea, in general the understanding of the contribution of forests to food security is still limited. Increased awareness raising to improve knowledge and understanding of the forest and food security nexus is essential to unlock the full potential of forests in sustainable food security.

Forests sustain life and are vital to the planet. Forests are not an obstacle to sustainable agriculture and food security; quite the contrary. With this important lesson in mind, all sectors and the stakeholders sharing a vision of food security must work together. An integrated approach across multiple sectors working towards the same goals is an absolute prerequisite for a country to achieve forest rehabilitation and food security at the same time.

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In the 1950s and 1960s, the Republic of Korea was one of the poorest and least developed countries in the world. Deforestation had stripped the country of half its forest cover, contributing to severe erosion, repetitive flood and drought damage and a decrease in agricultural production which threatened national food security. Recognizing the importance of forests' watershed and soil protection functions in restoring agricultural productivity, the government undertook an intensive forest rehabilitation effort. The implementation of two Ten-Year Forest Rehabilitation Plans in the 1970s and 1980s not only fully restored the country's forest cover, but also delivered food security benefits and contributed to national economic development. These goals were achieved by integrating forestry, rural development and community mobilization in the rehabilitation policy. This study demonstrates how the rehabilitation plans incorporated food and nutrition objectives and how forest rehabilitation contributed to satisfying the four dimensions of food security – food availability, food access, food utilization and stability of food security. This experience may provide inspiration for other developing countries desiring to incorporate forest rehabilitation and sustainable forest management in their food security goals and policies.



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