Forestry in Korea

by

Soon Koo Hong

A PAPER

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Forestry

June 1969

APPROVED:

Redacted for Privacy

Major Professor of Forest Management

Redacted for Privacy

Head of Department of Forestry

Chairman of Forestry Graduate School Committee

Date paper is presented March 3, 1969

Typed by Kathleen VanNice for Soon Koo Hong

ACKNOWLEDGEMENT

I wish to express my sincere appreciation to my major professor, Dr. John R. Dilworth, who introduced me to the forestry of the United States of America when I first arrived in this country.

My appreciation also goes to professors and students in the forestry school for their invaluable assistance to me while I have been studying forestry at Oregon State University.

The financial assistance from my father in Korea, Chong-In Hong, was also greatly appreciated.

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FORESTRY IN KOREA

I. INTRODUCTION

This report deals with forestry in Korea in its various aspects and what has been done about forestry problems in Korea.

The ratio of forest land to total area of country is so high that it is sometimes compared to Finland's, but the similarity with Finland stops there.

The adverse effects of forests left unpreserved, as well as the low density of trees in the forests of Korea, furnish one of the worst examples of forestry in the world. According to history, it seems that the forestry situation was not bad at all before World War II. However, by the continuing social disorder due to World War II and the Korean War, more than 50 per cent of the growing stock was destroyed. As a result, 49 per cent of forest land is wasteland where practically no trees grow, and the remaining 51 per cent of forest land has mostly seedlings. As a matter of fact, less than 20 per cent of the area grows what may properly be called useful trees. In particular, many areas not covered by trees are rapidly turning into wasteland because of the heavy rain in the summer. Of these, about 1,715,000 acres require urgent erosion control, without which the land will deteriorate into conditions defying rehabilitation. As a result of these conditions, frequently occurring floods have been a serious roadblock against the advancement of various industries.

An attempt has been made to explain how the government has been trying to solve forestry problems in Korea. Considering the alarming

situation in the country, the government has planned and tried to solve many problems. It has made an effort to reduce the consumption of forestry resources by the development of substitutes for timber in building and for other commercial uses, of alternative fuel both for industrial and domestic use, and by the development of heating systems affording maximum economy in the use of fuel.

But it has been difficult for Korea to rehabilitate its forests, facing so many forestry problems, as well as its present economic situation.

Still the main problem of forestry in Korea is over-exploitation caused by timber demand, which is greatly in excess of the increment that the solution of the problem for some years does not lie altogether in the field of forestry.

This report also has discussed what solution should be taken for forest problems. The forest problems in Korea should be solved by intensive forest management and by great government efforts.

II. LOCATION

Korea is a peninsula stretching from the north to the south in Northeast Asia and comprising some 3,300 islands.

The national territory lies between 124.11 and 131.55 degrees east longitude and between 33.7 and 43.1 degrees south latitude. The standard time is based on the meridian passing through the center of the peninsula along 127.3 degrees east longitude. The difference in time with Washington, D.C., is ten hours and thirty minutes, and with London, eight hours and thirty minutes (10).

The Korean peninsula separates the Yellow Sea from the Eastern Sea and neighbors with Japan to the south through a narrow strait, called the Korean Strait in Korea and the Tsushima Strait on the international maps. The boundaries on the mainland are the Yalu River, the Tumen River and Mt. Paektu. The area of Korea is 220,845 square kilometers, of which the main peninsula comprises 96.6 per cent with the islands making up the remaining 3.4 per cent. The part of the country north of the military demarcation line, comonly known as North Korea, is 125,608 square kilometers and that in the south, the territory of the Republic of Korea, 95,232 square kilometers. Korea can be compared with the British Isles, Rumania, or New Zealand in size; the southern part is almost equal to Jordan, Hungary, Poland, or Gautemala. It ranks among the smaller nations of the world (10).

The major portion of the country is mountainous, and only 20 per cent of the country is flat land. Korea is counted as one

of the rare mountainous countries in the world. The total population of North and South Korea exceeds approximately 45 million, and the population of South Korea alone is 29,207,856, according to the 1966 census (4).

III. TOPOGRAPHY

Korea is essentially a mountainous country. Broad river valleys of alluvial deposits occur among those mountains, even as wide as 15 kilometers in the valley of the Naktong Gang (river) near Samnanjin, but although there is nothing higher than 2,000 meters, the country is as mountainous as the Black Forest. Only in the extreme west is there any large extent of flat or gently undulating land which, at the widest part, does not extend more than 80 kilometers from the west coast.

The main watershed and the backbone of the country, the Taebaek Range, lies on the east side of the peninsula, and roughly follows the coastline about 15 to 25 kilometers inland. The high peaks reach to about 1,200 or 1,400 meters in the north, to about 1,000 meters over most of its length, sinking to 700 meters in the south. The watershed itself is mostly between 500 and 1,000 meters high. Thus, there is a short, steep slope into the deep Eastern Sea with tumbling, swift-flowing torrents which build up small alluvial plains as they reach the sea. There is plenty of quite serious erosion, but it is more or less confined to a strip along the coast itself. From this watershed range two main lateral ranges run roughly from northeast to southwest (18).

The more northerly ridge, the Charyong Range, runs through Kangwon Do,[1] borders Kyonggi Do and Chungchong Pukdo,[2] and continues

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[1] Do = Province

[2] Pukdo = Northern Province

southwest through Chungchong Namdo[3] almost to the sea some 10 kilometers south of Hannae Ri, the Sonju San, rising to 680 meters only 10 kilometers inland from the sea. There is one main lateral subsidiary mass running northwest towards Seoul.

The more southerly lateral ridge, the Sobaek Range, takes off in the south of Kangwon Do and more or less follows the boundary between Chungchong Pukdo and Kyongsang Pukdo. From not far south of the Bopju Temple near Boun it divides into two. One branch continues southwest through Cholla Pukdo into Cholla Namdo to near the sea near Hampyong. The other branch continues more or less south just to the east of the western boundary of Kyongsang Namdo; it then again divides into two not far above the highest point in South Korea, Mt. Chiri, at a height of 1,915 meters. One branch then goes southwest through the southeast corner of Cholla Pukdo east of Namwon and down into the center of Cholla Namdo, and the other branch continues south.

The ends of the Sobaek Range tail off in the southwest and south in the sea into a maze of islands, peninsulas, fjords, abrupt hills, and minute plains.

But the above ranges are only the framework. From them there are numerous lateral ranges, subsidiary ranges, spurs, and subsidiary spurs that break the whole country into precipitous hills of gneiss and steep-sided valleys carved out of the less resistant granite, and in every valley there is a stream even though it may run dry after the southwest monsoon.

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[3] Namdo = Southern Province

From the air the whole country appears to be a confused mass of mountain ridges running in all directions with all gradients, but on the whole steep and often precipitous and with all aspects. Only in the west of the mountainous area along some of the larger valleys, the valley of the Naktong River and parts of the Han River, is the country flatter and more open.

All the large rivers flow more or less west into the Yellow Sea, except the Naktong River, which flows south to empty into the Korea Strait a few kilometers to the west of Pusan.

The Han River rising in Kangwon Do near the main watershed on the slopes of the Mt. Kyebang, 1,577 meters high, flows south, then turns west, and near Chungju, turns northwest, and finally reaches Seoul in a winding course to the Yellow Sea. It has numerous tributaries, of which the Pukhan River may be mentioned; this tributary joins the right bank some 20 to 25 kilometers east of Seoul.

The next large river down the west coast is the Kum River. Rising not far from Changsu Ri in Cholla Pukdo, it flows in a winding course to the north, passing through the southwest corner of Chungchong Pukdo east of Taejon to below Jochiwon, where it sweeps around and flows southwest to empty into the yellow Sea at Kunsan, not very far north of where it rose. Just south of Chochiwon it is joined on the right bank by a large tributary, the Bogang Cheon (small river), which has flowed down from the northeast having risen about 30 kilometers northeast of Chongju.

The next river to the south worth mentioning is the Yongsan River, not so much because of its size, but because it is an example

of how deforestation, increased runoff and erosion, is silting up these west coast rivers. Some 25 years ago, motor boats up to 50 tons could sail up to Hongsangpo, some 60 kilometers from the mouth, on all tides. But now the same vessels can only come up at high tide.

The Somjin River rises quite near the source of the Kum River in Cholla Pukdo near Shangsu Ri, but flows in a winding course south and then southeast through Cholla Pukdo and Cholla Namdo, to empty on the south coast into the Korea Strait just south of Hadong.

The last really big river to mention is the Naktong River. It rises in the north of South Korea quite close to the source of the Han River on the west side of the main watershed, a little south of Samchok and not more than 20 kilometers from the east coast. Instead of flowing more or less west into the Yellow Sea, it flows almost south in a broad valley sometimes 15 kilometers wide, to empty into the Korea Strait a few kilometers west of Pusan. It has many large tributaries but the largest is the Nam River which, rising near the border of Kyongsang Namdo, makes its way eastward past Chinju to join the Naktong River on its right bank near Namji Ri some 35 to 40 kilometers northeast of Chinju as the crow flies.

All these large rivers have formed broad valleys of alluvial plains or low, gently sloping, undulating country full of terraced rice fields with the low hills often bare, eroded to the subsoil. and gullied and ravined.

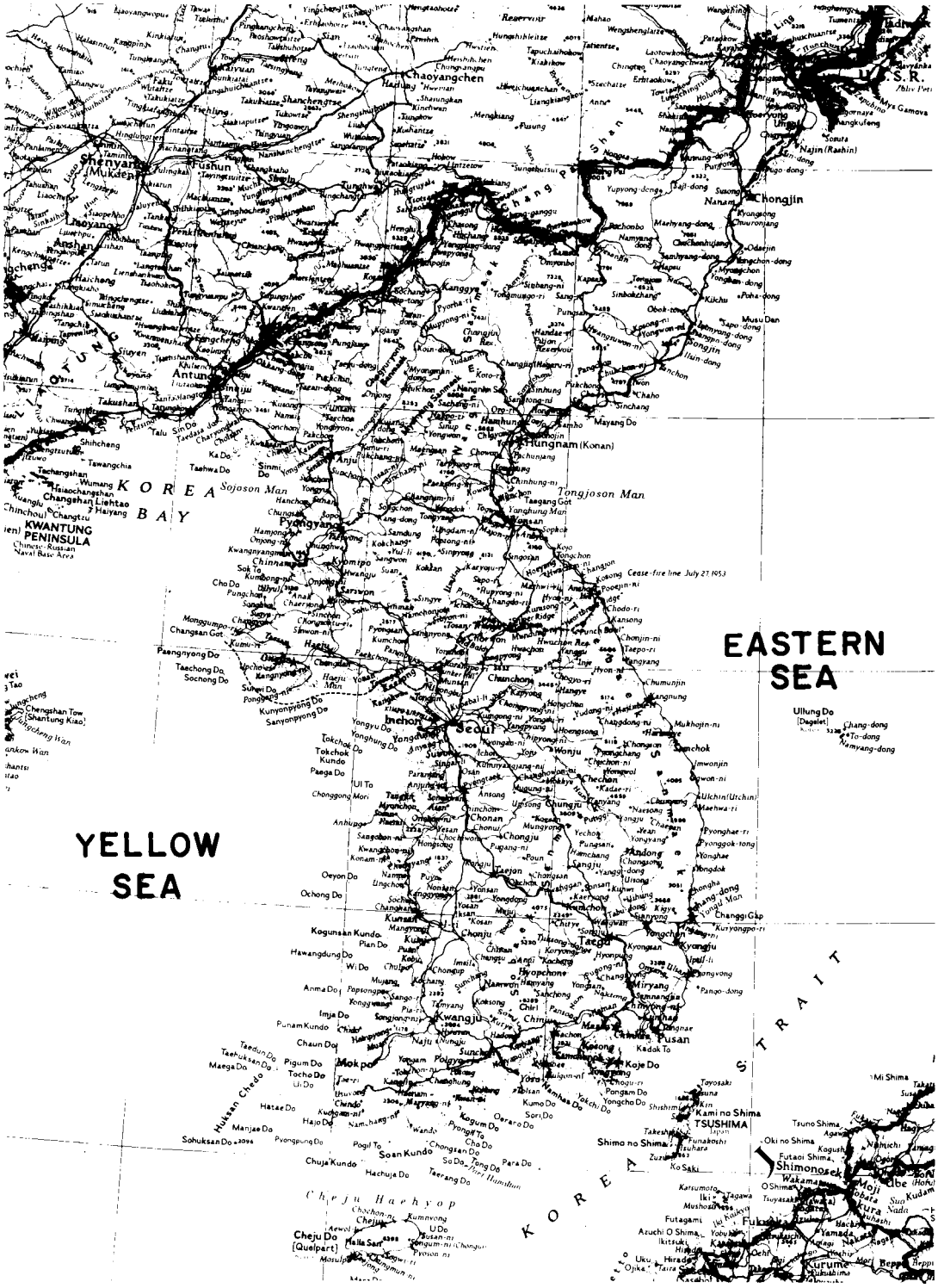
In the west in the lower reaches of the three larger rivers mentioned, the Han, the Kum, and the Yongsan, together with their numerous tributaries and other rivers in that area not specially

mentioned, such as the Sapkyo Cheon, Yugu Cheon, Ansong Cheon, and many others, a large alluvial plain has been built up and the area is now flat or low gently sloping undulating hills, except where the main ranges run out into the country.

This low country forms a great arc of land beginning in the north from above Seoul in Kyonggi Do, then on to near the junction of the boundaries of Kyonggi Do, Kangwon Do, and Chungchong Pukdo, and around back to the sea near the Yongsan River. Naturally, the boundary of the arc is very irregular, extending in tongues far up the valleys of the large rivers and their tributaries.

The other large area of such country is in the broad valley of the Naktong River, in the valley of its great tributary the Nam River, over the large delta south from Kimhae where it debouches into the Korea Strait, and up all the valleys of the larger tributaries.

KOREA


KOREA BAY
Sojoson Man
Tongjoson Man
KWANTUNG PENINSULA
YELLOW SEA
EASTERN SEA
KOREA STRAIT
Cease-fire line July 27 1953
Pyongyang
Seoul
Inchon
Pusan
Taegu
Kwangju
Taejon
Mokpo
Chinnampo
Sinuiju
Antung
Hungnam (Konan)
Chongjin
Najin (Rashin)
U.S.S.R.
Shenyang (Mukden)
Chaoyangchen
Ullung Do
Cheju Do (Quelpart)
TSUSHIMA
Kami no Shima
Shimo no Shima
Shimonoseki

IV. NEEDS OF THE RURAL COMMUNITIES AND AGRICULTURAL CUSTOMS

Geographical Conditions of Korean Village

Villages in Korea are, almost without exception, so settled as to face the plains and turn their backs to the mountains. In other words, typical Korean villages shoulder mountains and face streams. The pattern was shaped mainly under the influence of the divination theories that have been prevalent in Korea from the remote ages. The pattern still offers various practical advantages to the inhabitants in many ways.

Mountains rising north of the villages provide effective shields against the cold northwest winds in winter. The gentle slopes that the villages face to the south are extended to the plains in front of them to absorb greater beams and heat from the sun during the day, thus making for evening warmth. Thus the mountains bar the chilly winds and preserve the solar heat.

The plains skirting the villages to the south serve as farmlands, and irrigation of rice paddies is relatively easy, as few villages are without streams running nearby. Because of streams, the villages are also spared the problem of water shortage in dry seasons; because of mountains, winter fuel is easily procurable. Smooth drainage is possible, as are abundant crops and a variety of natural products (10).

Functions and Forms of Korean Villages

Korea is an agricultural country, and all the villages in the country are farming villages. As a peninsula, Korea also ranks

among the nations blessed with rich maritime resources. She has a small number of fishing villages, some strictly so, but most relying on both fishing and farming for their existence.

Although Korea is a mountainous country, few mountain villages are to be found, because the forests are denuded. Only a limited number of mountain-farm villages are scattered over the mountainous area, presenting a singular picture.

One of the characteristics of Korean villages is that the majority of them are heavily crowded with houses in narrow spaces. Such "concentrated villages" were originally formed mainly to protect the villagers against possible enemy attacks or such natural calamities as floods. Of course, conveniences, such as common use of water, and the sheer grouping instinct of the human being, also played their dominant parts. But in times of disturbances and insecurity, it was vital to live closely together and protect the constituents' lives or properties against their common enemies. Also for protection against intruders, the majority of the ancient cities of Korea were surrounded by walls.

Rice farming, for which irrigation is essential, constitutes the major part of agriculture in the monsoon areas of Southeast Asia, and Korea is no exception. The irrigation projects for rice paddies require great labor on the part of the beneficiaries, the villagers. Transplanting and harvesting rice require an exchange of labor among the villagers. Thus, one of the major reasons for the formation of "concentrated villages" stems from agricultural needs.

Except in summer, most of the year is dry, but few villages

suffer from a shortage of drinking water, because Korean villages hardly ever fail to shoulder mountains as a backdrop. The mountains serve as a reservoir that supplies drinking water to the wells that are dug in villages. Usually, a well is dug for common use by several households, and one of the most familiar sights of the Korean countryside is the housewife carrying a water jug on her head from the communual well to her home early in the morning. A village has several such common wells, and usually ten or more families depend on one for their potable water.

Since most of the forests are sparse, the mountains bald, and temperature differences marked, the people are strongly affected by the climate. Big floods are not an uncommon disaster. In order to counter the floods, banks were constructed along rivers, and the embankments, in turn, required heavy labor and cooperation among villagers. This was also one of the factors that necessitated the formation of "concentrated villages."

It is to be noted that the distribution of family villages becomes rarer the deeper north one goes. The largest number of family village units have appeared since 350 years ago, presumably in the wake of the Japanese invasion. It is conceivable that the people, fleeing before the muskets of the foreign invaders from the south, formed villages wherever they happened to settle down in groups with the same blood-tie.

If villages in Korea are to be classified on the basis of population, there are 150 villages embracing more than 150 families, 251 with 100 to 150 families, 498 with 60 to 100, 595 with 30 to 60,

and 191 with 30. Thus, those embracing 30 to 100 families constitute about 65 per cent of the total. The big villages with more than 100 families are dominant in the Cholla Province and Kyongsang Province (10). The steady decline of such villages, however, has become inevitable under the impact of industrialization, expansion of urban areas, and development in traffic facilities.

Contrary to the case of the concentrated villages, the so-called "scattered villages" in which houses are somewhat separated, have had little chance to grow in Korea. This was only natural in an agricultural country producing rice as the chief crop. Today most of the scattered villages are to be found over the Kaema Plateau and Taebaek Mountains.

The mountain-farm is the issue of what might be described as plunder farming. Mountain-farm villages have been developed chiefly by those who, losing out in the struggle for existence, escaped deep into the mountains to burn the woods and cultivate untrodden hills. The mountain-farmers usually cultivate acreages a multiple number of times larger than those of the ordinary farmers. It is under such conditions that the mountain villages became scattered.

In Korea, demands of the rural population, which is more than 60 per cent of the whole population, on the forests, are much the same as those of agricultural populations over much of Asia. Small timber is used for houses and agricultural implements; wood for fuel, leaves, grass, and litter for compost; and, peculiar to Korea, there is a very heavy demand for pine needles, lopped branches, tiny trees, and litter for kindling material. There is no very great demand for grazing.

What seriously affects the forest and forest land is the excessive demand for fuel, the raking off of pine needle litter, the lopping of pine branches, and even the cutting of tiny plants of 90 centimeters and less in height for quick kindling, and the continual cutting and lopping of broad-leaved trees, the raking up of fallen leaves, and the cutting and raking of grass for compost.

Lopping, as it is done, inflicts the maximum damage. Little pines five or six years old are lopped. Trees are often cut off to leave only a tuft for a crown, and with six-inch snags which effectually ruin any timber, even if the mutilated tree is allowed to grow. Frequently the leading shoot is cut, and a side shoot takes on the function of leader with induced contortion. The young broad-leaved trees are cut flush with the ground. Though the villagers are careful to leave one shoot, that will be the first shoot cut the next year. The result is that vast areas have been turned from a mixture of oak with pine into pure scrub pine. The raking not only removes all humus and grass, but also scratches into the surface and loosens it.

The use of the Ondol, which is a kind of heating system, is another system which creates a huge demand for quantities of fuel.

V. FOREST LAND AREA

The total area of South Korea is 8,854,000 hectares. Of this, an area of 135,000 hectares is classed as unproductive land, and 2,250,000 hectares are divided between tilled area, orchards, and mulberry cultivation. The rest, in round figures, 6,469,000 hectares,[4] is classed as forest land.

National forest is that directly under the control of the Central Bureau of Forestry, and public forest is forest belonging to a province, city, municipality, township, or school. Temple forest is forest land belonging to a temple. Former royal forest is forest formerly owned by King Yi, which is likely to become national forest by legislation. Vested forest is forest formerly owned by the Japanese, and is likely to become national forest by legislation. Private forest is owned by individuals or companies.

As the total area of South Korea is 8,854,000 hectares, it will be seen that forest land makes up 73 per cent of the total. Of the 752,242 hectares of national forest, 244,588 are classified as outside the area to be managed by the Central Bureau of Forestry. At present, this forest land is under the control of the provincial authorities.

If both the royal forest land and the vested forest become national forest, and the temple forest is included, then the total area under some form of public ownership is 1,892,213, or 12 per cent. In such a mountainous country, 20 per cent of the total land area, even under properly managed forest, would usually be considered

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[4] One hectare = 2.471 acres.

insufficient for the general physical well-being of the country to regulate water conservation and to prevent erosion. Therefore, the Central Government must take steps to control the management of both publicly and privately owned forest land. The forest land is classified as shown below (3).

Table 1. Classification of Forest Land

City and Province	National Forest	Public Forest	Temple Forest	Formerly Royal Forest	Vested Forest	Private Forest	Total
			(In hectare)				
Seoul	2,527	248	46	315	861	1,880	5,832
Kyonggi Do	12,139	50,779	2,694	8,132	65,781	584,258	723,783
Chungchung Pukdo	40,093	92,198	3,727	-	55,946	342,790	534,754
Chungchung Namdo	9,956	39,618	3,595	5,500	27,899	411,162	497,730
Cholla Pukdo	54,425	35,913	6,492	550	36,892	406,938	541,210
Cholla Namdo	33,622	35,608	13,792	-	58,483	664,476	805,981
Kyongsang Pukdo	104,285	138,814	20,894	4,634	102,923	1,018,051	1,389,601
Kyongsang Namdo	35,511	62,172	19,799	1,691	40,594	685,418	845,185
Kangwon Do	430,211	109,271	13,614	1,132	77,663	443,966	1,075,857
Cheju Do	29,473	166	16	-	1,564	17,710	48,929
Total	752,242	564,787	84,669	21,954	468,561	4,576,649	6,468,862

Bureau of Forestry, "Outline of Forestry in Korea." M.A.F., Seoul, Korea, 1952.

VI. SHIFTING CULTIVATION

There are many areas where shifting cultivation (fire fields) is being practiced. So far this does not appear to be a serious menace, but only because it is, as yet, practiced over a comparatively small part of the total area. Unfortunately, however, it is done on the steep slopes above areas of normal cultivation, and in the very areas where a forest cover is most necessary on physical grounds. Not only does shifting cultivation destroy the forest and rapidly reduce soil fertility, but it will encourage accelerated erosion more than any other land use. Fire fields have been a curse throughout the world, except in those few places where they have been controlled and moulded into a system of forest management. Even then, burning is never practiced on steep hillside.

This practice was always far more widespread in North Korea than in South Korea. The following table shows the approximate area under shifting cultivation after the Korean War in South Korea.

Although the figure for 1952 is only the area for that year, and does not show how quickly ruin might spread, it seems evident that shifting cultivation is a menace only in Kangwon Do. Unfortunately, these are the best forests in South Korea.

Grazing is not a forest problem in South Korea at present.

Table 2. Area in South Korea Under Shifting Cultivation in 1952

Province	Total Forest Area in Hectare	Cultivation Shifting Area in Hectare	Percentage
Seoul City	5,832	1	Negligible
Kyonggi Do	723,783	861	0.1
Chungchung Pukdo	534,754	1,840	0.3
Chungchung Namdo	497,730	61	Negligible
Cholla Pukdo	541,210	1,211	0.2
Cholla Namdo	805,981	204	Negligible
Kyongsang Pukdo	1,389,601	3,995	0.3
Kyongsang Namdo	845,185	1	Negligible
Kangwon Do	1,075,857	47,351	4.4
Cheju Do	48,929	51	0.1
Total	6,468,862	55,576	0.8

U.N.K.R.A., "Agriculture, Forestry and Fisheries in Korea," 1956.

VII. FOREST ENVIRONMENT

Climate

The climate is determined by all the climatic factors such as the atmospheric pressure system that develops between the continent and the ocean, the marine current, and other factors. In other words, the so-called mild peninsular climate is influenced and formed by the continental weather of the Manchurian-Mongolian region and by the marine weather of the Pacific Ocean. Besides, as Korea is located between the largest continent and the ocean, the climate represents an Asian monsoon type.

The hot, humid summer is caused by the Asiatic monsoon, which also characterizes dry and wet periods, and the cold, dry winter is caused by the continental weather.

The rise and fall of winter monsoons and the continental clyclo-warmness developed in Mongolia account for the weather pattern of "three cold days and four warm days" which eases the long, rather dry, cold winter.

The amount of yearly precipitation ranges from 600mm to 1,500mm (25 inches to 60 inches) (13) with the southern and eastern parts receiving an abundant amount, and the western and northern parts less. This pattern of distribution of the precipitation is quite different from that of the temperature, however. Much precipitation is brought in by the southeasterly monsoon from the Pacific Ocean during the summer, while the northwesterly monsoon from the continent,

replacing the southeasterly one, brings in a little amount of precipitation during the winter. Precipitation received during the three summer months, June, July, and August, accounts for 55 per cent to 65 per cent of the yearly precipitation. Precipitation in July alone accounts for 30 per cent (13).

This peculiar pattern of climate, coupled with destructive human action on forests in the recent centuries, is assumed to be one of the major causes for the accelerated soil erosion. The concentrated rainfall of short duration and overuse of forest materials have created an off-balance in the equilibrium between soil development and soil erosion.

In general, there is a very short autumn, the temperature falling very rapidly during October, with a long cold season as cold as that of north central Europe. The days are bright, and there is very little rain. The spring is short, with a rapid rise in temperature in February in the south and elsewhere in March, and with some increase in rain from pre-monsoon showers. By June, and up to September, the temperature has risen to make the climate muggy like that of many parts of the tropics.

Forest Soil

1. Character of the soil: Korean soil is characteristic in that the proportion of displaced alluvia, composed of soil carried away from base rocks by such external forces as rain, streams, and winds, is greater than that of stationary alluvia composed of soil that is not carried away by such forces. The most common

rocks in Korea are granite, 27 per cent, and gneiss, 36 per cent (11). Also abundant are such igneous rocks as basalt and porphyry and sedimentary rocks like limestone, argillite and sandstone. The greater part of Korean soil is, therefore, made up of granite and gneiss. Such soil is generally sandy and contains only 12.5 to 37.5 per cent clay (10).

The southern part of Hamkyong and Kangwon Provinces is the limestone belt of Korea. The soil there is known as terra rosa, and is of a reddish brown color. The proportion of clay contained in the arable soil of Korea diminishes to the north.

2. Forest soil: Within the forest area, though all classes of soil occur, from coarse sand or sand containing varying amounts of pebbles and little or no humus, to sandy loam or loam, there are very few clay areas in the forest land, these mostly occurring in the valley bottoms given over to agriculture. There is little variation in the forest soil throughout South Korea. The soils are inclined to be acid (pH value about 4.5 to 5.5) (16). The forest soils, though of poor quality, are sufficiently fertile for the growth of trees. The low fertility is largely due to abuse by man. If man is prevented from removing the litter, and a mixture of broad-leaved trees is encouraged, the soil fertility will undoubtedly improve.

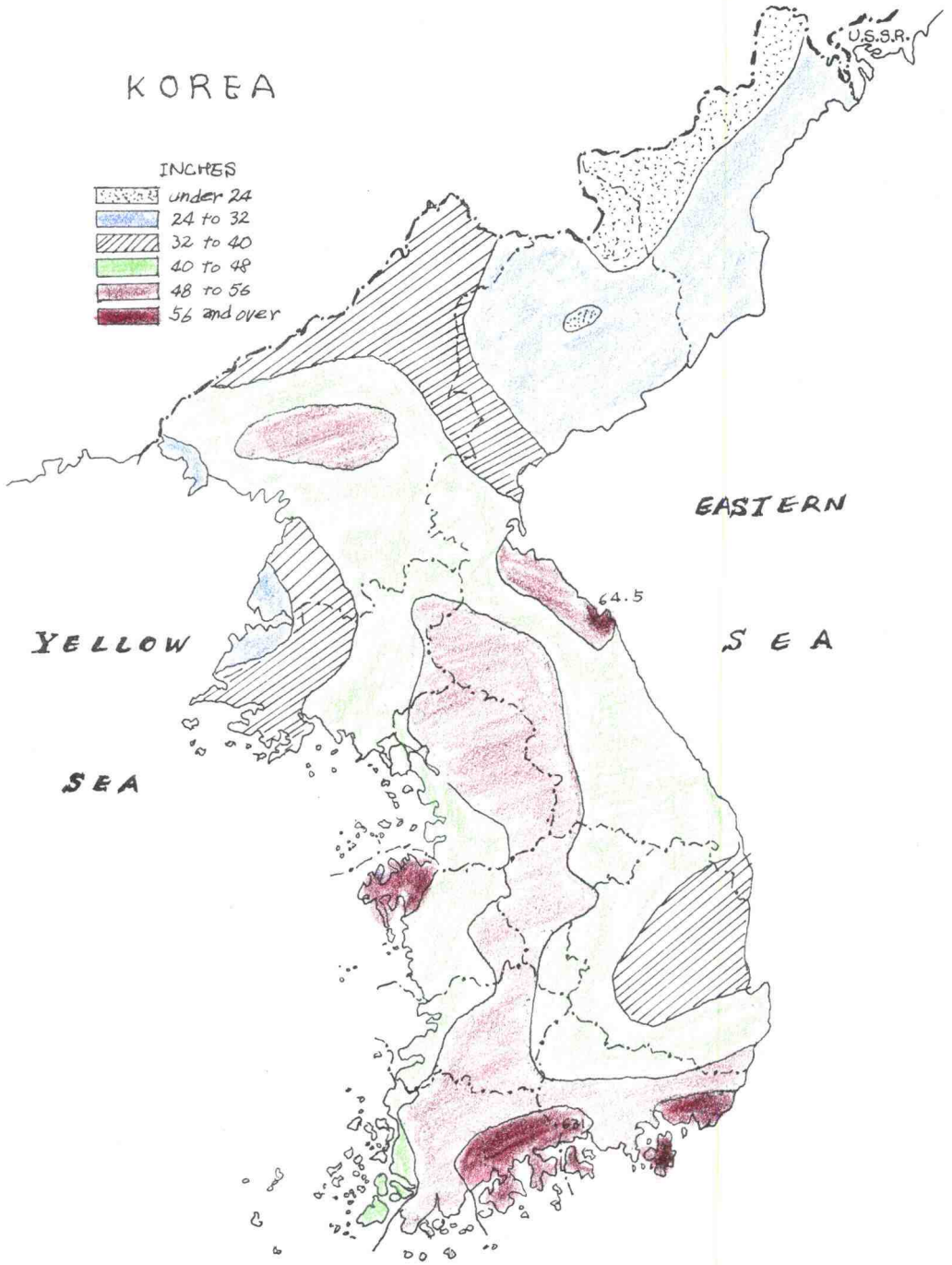
Because of the high temperature, the long insolation period, the concentrated intensive rainfall in summer, and the cold winter, podzolized soil, brown forest soil, red soil, and yellow soil, which so resemble the southern soil types of the United States, have been formed. However, distinction of these soils is not easy due to the rugged

physiography, the variety of vegetation, and the complexity of soil types and series.

Brown forest soil is distributed nearly all over the nation, ranging from Sungjin in the north to Pusan and Mokpo in the south; podzolized soil is found in the northern part of Choongkangjin in Hamkyung Province; and yellow and red soil are found in the southern part of Hamkyung Province and Cheju Island.

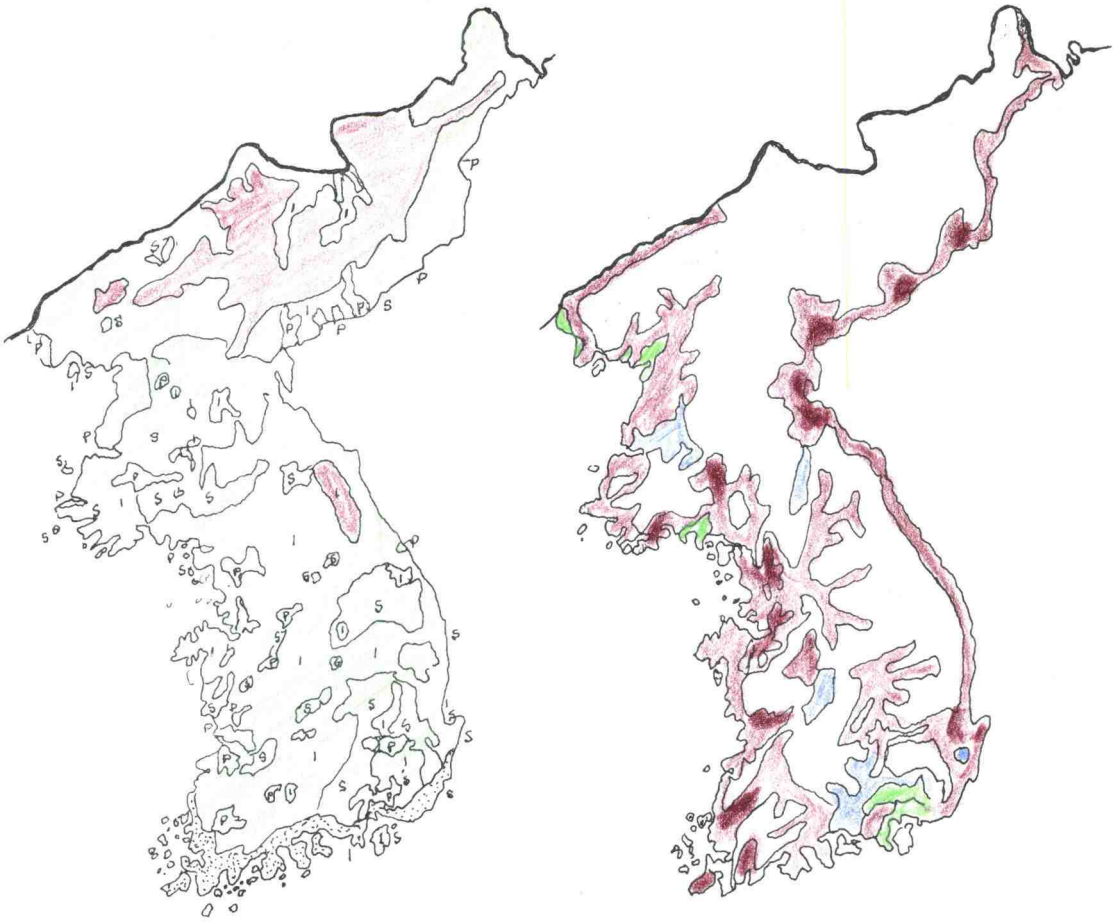
Temporary destructive human action on forests has exposed the forest floor and caused run-off of humus and top soil. Granite-gneiss rock, the most typical geological series found in Korea, has been exposed in wide areas. This basic rock is particularly noticeable in the southern part of Kyunggi Province as the gently rolling rock mass, and is usually cracked open. As this rock mass lies on or near the surface, the resistance to weathering is poor and the disintegration is rapid, which result in erosion and soil run-off to raise the river-bed.

AVERAGE ANNUAL PRECIPITATION



Soil Groups, Materials, and Textures

KOREA



VIII. DISTRIBUTION OF SPECIES

From the forester's point of view, there appear to be three climatic formations: temperature, subtropical and polar forest zones. But, except for high elevations in South Korea, the polar forest zone belongs to North Korea.

Temperate Forest

The temperature forest consists of Pinus densiflora with or without deciduous broad-leaved species, or deciduous broad-leaved species with or without Pinus densiflora.

These two subtypes occupy the whole of South Korea except for a narrow strip in the extreme southwest and south. There are minor edaphic variations, though possibly the pure deciduous broad-leaved forest found, for example, on the watershed above Kangnung in Kangwon Province, may be climatic. There is not a sufficient stand of it to make it of any importance. It would appear that the large areas of practically pure Pinus densiflora are kept in that condition because man continually removes the broad-leaved trees. The natural indigenous forest appears to be Pinus densiflora predominating, with an admixture of Quercus acutissima, Quercus dentata, Quercus serrata, Quercus variablis, and, in lesser numbers, Castanea crenata, Rhus verniciflua, Zelkowa serrata, Alnus japonica, Acer aizuene, and others. Tilia amurensis, Fraxinus thynchophylla, and species of Ulmus, Abies holophylla occur here and there and are faster growing, better and straighter trees than Pinus densiflora. It has practically disappeared except from a few protected groves, though odd trees

remain in the forest, both in Kyonggi Province, north of the Han River, and in Kangwon Province. Populus maximowicizii is common along fields and other low-lying areas. Robinia pseudoacacia was introduced many years ago, has gone wild, and is now widely distributed at low altitudes. There are many other roadside trees, but they remain just that. There appear to be very few natural Pinus koraiensis, a five-leaved pine looking very like Pinus strobus and which produces an edible nut, though there are a number of plantations, especially in Kangwon Province. Pinus koraiensis seems to florish and is a better tree than Pinus densiflora. There are also many plantations of larch, mostly of Larix kaempferi, but some of Larix japonica, and it appears to do remarkably well and should be encouraged. Larch is widely planted in Kangwon Province, parts of Kyonggi Province, Chungchung Pukdo, and even down in Cholla Pukdo and Kyongsang Namdo; it is a fast-growing straight tree.

The two-needled Pinus densiflora is a poor tree. Trees in all classes of forests appear to be contorted, though the boles themselves are occasionally straight. There is ample evidence to show that much of the contortion is caused by lopping, and that young trees, at any rate, will grow perfectly straight with a season's shoot 27 inches long if they are not mutilated. Evidence can be seen near the battle front above the so-called "Farmer's Line," beyond which no cultivation has been allowed since the front became stabilized. There, and on certain areas near Wonju, there are perfect young crops. Whether the contortion has increased by the complete removal of all humus for many years, it is not possible

to say. It is true that in the best forest seen, King Yi forest near Yongwol in Kangwon Province, some trees were up to 60 centimeters in diameter, 25 meters high, and about 100 years old. There was a layer of humus, and the trees were still contorted. It is pointless, however, to argue for a change in species. For at least one rotation there can be no question of radically altering the species over anything but a fraction of the area involved.

There are considerable areas classified in the records of the Bureau of Forestry as areas of broad-leaved trees, the species being those listed as occurring in the pine areas. A good many of these areas contain some proportion of conifers. Other areas are so nearly devoid of pine that they might be looked upon as another formation. It was not possible to visit such areas, partly because they were too remote to be seen at the time, partly because those areas are the hiding places of the guerillas, and one is not permitted to travel there. However, as a large proportion of Pinus densiflora occurs up to the 38th parallel to the tops of the hills, and since areas of this formation are in the same place and altitude, it would appear that this broad-leaved forest is an adaphic formation if it is really different. It is for this reason that it is included here.

Near the villages the continual cutting and lopping of the broad-leaved trees has favored Pinus densiflora, which is very hardy and regenerates prolifically. In the more remote areas whatever felling there has been has tended to favor the broad-leaved trees which have progressed nearer to the climax formation.

It would appear that wherever protection is given, the percentage

of broad-leaved trees increases at once as in the Popju Temple forest in Chungchung Pukdo or the Sonju San Provincial forest in Chungchung Namdo. The mixture would appear to be a preclimax, and the climax formation for all this part of South Korea might well be a forest of mixed deciduous broad-leaved trees.

South of about the 36th parallel, bamboo plantations (Phyllostachys reticulata) become increasingly common and generally improve in quality the further south one goes.

Subtropical Forest

Pinus thunbergii, Pinus densiflara, with or without deciduous and evergreen broad-leaved species abound in the subtropical forest.

This formation occurs only in a narrow strip running from Kokpo in the southwest, on the neighboring islands, and as far east as Pusan. It consists of pure patches of either pine or of pine mixed with the broad-leaved species, or the broad-leaved species without the pines. It would appear that the variations are caused by man or by insect damage, and that the natural formation is pine with the broad-leaved mixture. (See, for example, the Techung Temple forest in Cholla Namdo.)

The common broad-leaved trees are Camellia japonica, the most conspicuous because of its very shiny dark grean leaves, Carpinus coreana, Quercus acuta, Quervus myrsinefolia, Celtis sinensis, and Hybiscus syriacus (14). Again it would appear that the climax formation may be broad-leaved species only. In the Taehung Temple

forest there appear to be no conifers left (though it is said they were only felled as a result of an attack by Cecidomya), except plantations of Cryptomeria japonica and Japanese cypress (Chamaecyparis obtusa). The formation seems not to occur above about 400 meters above sea level.

Polar Forest

The characteristic tree species of the polar forest are Abies nephrolepis, Piea koraiensis, Larix olgensis Henry var. Korean Nakai, Abies holophylla, and Korean white pine. Parts of the climax coniferous forest destroyed by human activities and forest fires have been replaced by vigorous growth of Betula schmidtii, Betula coaslets, Populus davidiana, and Textoria morbifera (14).

This area occupies the plateau and high mountain in Pyungan and Hamkyung Provinces where the yearly mean temperature is 5°C (41°F) or lower, Mt. Hanla at 1500m (4,920 ft.) or higher altitude, Mt. Chiri at 1300m (4,264 ft.) or above, Mt. Diamond at 1150m (3,752 ft.) or above, Mt. Sulak at 1160m (3,805 ft.) or above, and Mt. Baekdu at 600m (1,968 ft.) or above.

IX. GROWING STOCK

There are no reliable data of either volume per hectare, density of stocking, or increment. The data available are by totals for provinces. The estimated standing volume is shown in Table 4, page 29.

In all the volume data, the total stem volume to the top is taken, and all trees three centimeters in diameter and over are included.

The following table shows the estimated volume per hectare for the different classes of forest by provinces.

Table 3. Estimated Volume per Hectare of Forests

City or Province	National Forest	Public Forest	Temple Forest	Former King's Forest	Vested Forest	Private Forest	Total Avg.
			(In Cubic Meters)				
Seoul	0.9	0.2	1.5	0.7	4.9	0.1	1.2
Kyonggi	3.2	6.3	3.5	13.1	4.7	1.7	2.6
Kangwon	16.2	6.8	15.9	36.6	7.4	4.6	9.8
Chungchung Pukdo	5.5	4.7	5.8	-	4.7	3.2	3.8
Chungchung Namdo	1.1	3.1	8.0	5.2	2.3	1.4	1.6
Cholla Pukdo	7.3	6.8	5.7	4.2	3.4	3.6	4.0
Cholla Namdo	4.4	5.0	1.3	-	3.1	7.8	3.8
Kyongsang Pukdo	6.6	6.5	1.7	8.3	3.6	3.3	4.3
Kyongsand Namdo	2.0	8.7	15.8	14.2	2.3	5.7	4.0
Cheju	28.1	3.8	2.0	-	6.9	0.5	19.4
Total Avg.	13.3	6.1	13.6	11.0	5.2	2.9	4.8

Outline of Forestry in Korea, October 1952.

Table 4. Estimated Standing Volume of Forests

City or Province	National Forest	Public Forest	Temple Forest	Former King's Forest	Vested Forest	Private Forest	Total
			(In Cubic Meters)				
Seoul	2,319	42	70	205	4,015	203	6,854
Kyonggi	38,246	317,981	9,298	106,369	309,898	1,011,736	1,874,528
Kangwon	6,979,284	743,380	217,187	41,469	574,567	2,024,671	10,571,588
Chungchung Pukdo	219,989	432,185	21,494	-	264,247	1,108,606	2,046,519
Chungchung Namdo	11,727	114,095	28,754	28,754	62,987	563,663	809,813
Cholla Pukdo	394,991	243,067	36,876	2,332	126,827	1,347,711	2,151,805
Cholla Namdo	161,073	177,390	169,039	-	454,738	2,062,216	3,024,456
Kyongsang Pukdo	687,412	905,329	357,012	38,269	340,513	3,648,041	5,976,576
Kyongsang Namdo	695,226	543,743	312,537	23,949	232,860	1,604,742	3,413,057
Cheju	827,754	627	32	-	834	122,392	951,639
Total	10,018,021	3,368,839	1,152,130	241,347	2,452,487	13,493,981	30,826,805

"Outline of Forestry," Bureau of Forestry, R.O.K.

Although the data may not be accurate, it betrays a lamentable state of affairs. The growing stock in Japan is about 62 cubic meters per hectare[5], so that the best forests in South Korea, the National and Temple Forests, have only about 21 per cent of the Japanese growing stock, the private forests less than 5 per cent, and the average forest has under 8 per cent. However, the basic data are probably optimistic. There seems to be no record of when the last enumeration survey was made, nor of the percentage of area enumerated, nor of the data used to translate that enumerated area into volume. In 1946, a computation of the growing stock was made which gave a volume of approximately 85 million cubic meters and an increment of 3.8 per cent. Nevertheless, as most of this increment was on trees too small to fell, the permissible yield was put at just under two million cubic meters, an increment of 2.4 per cent on the full growing stock.

Another computation--there is no record of any measurement--made in 1950, puts the figure at just under 71 million cubic meters, reckon the increment at 4 per cent, and the permissible yield as again 2.4 per cent. The figures seem to have been deduced in some way from the 1946 figures (21).

But a still later report gives a figure of 65 million cubic meters in 1942 reduced to 30,826,805 by 1952. This last figure has been used to calculate the growing stock per hectare (3).

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[5] Empire Forestry Handbook, 1952.

A figure of six per cent has been used for some time to calculate increment. It is known that very large unrecorded illicit fellings have taken place since 1945. The last enumerations and measurements were made in 1933 for private forests and in 1943 for other forests. The figure of 30,826,000 cubic meters seems merely to have been estimated by subtracting recorded fellings less increment at six per cent from previous figures. As the recorded fellings are far below the real fellings, and at the increment of six percent is too high, it is probably that the real growing stock is below 30,826,000 cubic meters and that the volume per hectare is even lower than shown.

Density of Stocking

There have been various estimates of stocking reported, probably based originally on a proper unit inspection of the area. The latest figures are:

	National Forests		Area in Hectare
1.	Fully stocked	679,242)	
2.	Blank or so open as to need artificial regeneration	) 73,000)	72,242
	Other Forests		
1.	Fully stocked	2,166,825)	
2.	Opened by fellings but expected to regenerate naturally	)) 1,678,147)	5,716,620
3.	Blank or sufficient open to need artificial regeneration	) 1,394,949)	
	Planting	32,050)	
	Sowing	444,649)	
4.	Area in need of special erosion control work		
			6,468,862

By these figures, about 90 per cent of the national forest area is fully stocked. This percentage may be correct, the great deficiency in volume of growing stock per hectare being accounted for because the age class distribution is very abnormal. Still, it is doubtful whether 90 per cent is fully stocked. The inspection seems to show that the national forest, so much of which is in the pole stage, is understocked, but may close sufficiently to need thinning within the next ten years. Of the "Other Forests," about 38 per cent is entered as fully stocked; it seems certain that this percentage is much too high to be accurate.

Distribution of Age Classes

Again, no real data exist for distribution of age classes, but as a series of estimates have been made from time to time, probably based originally on a unit inspection.

In 1950 the following estimate was made: (21)

	Percent	Hectare
1. Barren, denuded, or very poorly stocked forests	30	1,940,659
2. Trees up to 20 years old	45	2,910,989
3. Trees 21 to 40 years old	15	970,330
4. Trees 41 to 60 years old	5	323,442
5. Trees over 60 years old	5	323,442
	100	6,468,862

From the limited and rapid tours which it has been possible to make, not many forester can disagree with those figures, which may well be approximately correct. Where there is forest at all, the

predominant impression is of rather understocked pole forest below, rather than above, 20 years old, with some older trees. A number of felled poles over 20 years old were counted, and there must be some scattered trees of the higher ages.

Increment

Height increment naturally varies with quality. The better quality tree Pinus densiflora, will attain a height of 18 meters in 50 years, one of medium quality will reach 13.5 meters in 50 years, and even a tree of poor quality will reach nine meters in 50 years. This height compares very well with that of Scots pine of the same age, and poor quality Pinus densiflora slows down earlier than Scots pine, and the best crops reach only about 24 meters at 100 years of age, medium crops reach 20 meters, and poor crops reach 16 meters. Height growth is very susceptible to soil quality, and it can be hoped with some confidence that height increment will improve with intensive forest management and by leaving the humus.

Form factors seem to be poor. They will certainly improve with better silviculture.

Diameter increment is good. Depending on quality, trees will reach anything from 12 centimeters to 32 centimeters at age 50, definitely better diameter increment than that of Scots pine in Europe (20).

X. HISTORY OF FOREST ADMINISTRATION

Objectives of Forestry Administration

It would seem unnecessary to explain the importance of the forests in promoting national economy, conservation and welfare. Unfortunately, a large part of the forests which was ignorantly cut has become nonproductive. During the rainy season, the devastated forest land has been the source of an enormous amount of soil run-off, which has been an unavoidable threat to human lives and properties. Also, the water yielding capacity of the forested watershed during drought has been drastically reduced. Furthermore, the fact that nearly all of the stocked forest land consists of young trees introduces the need for protection and tending of the forest for harvest. These factors emphasize the need for forest administration as an important task of high priority.

Therefore, reforestation on devastated or nonstocked forest land is urgently needed; tree growth must be accelerated through improving forest land productivity; positive implementation of an intensive management of the existing forest must be executed for an increased forest production; and ultimately an increased forest income must be attained through multiple and efficient use of forest land. By practicing these tasks, forest management will be rationalized and forestry will be made economically appealing. Only then, forestry will be positively contributing to the cause of national development.

In order to achieve these purposes, the major objectives of forestry administration are set up as the following: (19)

1. Conservation of national land and permanent measures against calamity resulting from poor conservation.
2. Improvement of productive capacity and productivity.
3. Increase of forestry income.
4. Renovation of forestry organization.

In order to attain the above objectives, intensive forest management must employ a positive and efficient policy, departing from the practice of "forest protection first." Forestry administration in the past overemphasized a conservative policy of forest preservation, making an unsystematic effort to avoid only natural disasters and human destruction. However, facing the serious wood shortage today, the Korean people have no choice but to endeavor to improve the productive capacity of their forests. As the result, the policy of supply and demand on forest products gave way to the restrictive measure on tree cutting. In view of the increased demand for forest fuel for farm family use, the fuel-wood forest establishment, a reforestation program for non-national forest land, is being positively implemented in order to produce self-supply. A measure to convert fuelwood to coal, as well as an effective way of consuming coal economically is being encouraged.

For the purpose of timber production, reforestation is being implemented on national forests with priority, so that a maximum net volume growth can be expected under a sustained yield system.

Simultaneously, undesirable and inferior stands within national forests will have to be totally eradicated. The policy of encouraging forestry in non-national forests in which reforestation has been subsidized by the government will have to be terminated gradually, and reforestation without government subsidy be strongly encouraged by creation of a reforestation fund system of long-term loans.

Erosion control work, one of the major objectives of the forestry administration, is being implemented through national participation in order to accomplish as much work as possible within the shortest possible period. Supplementary work is also being done to ensure successful results.

In addition to these productive policies, a renovation of the forestry organization is needed; that is, a standard of size for the least forest land ownership should pave the way to rational management, particularly in non-national forests. Such a standard needs to be established as early as possible in order for the adjustment of management plans and the organization of national forests to be realized.

Forest Administration Until the Liberation in 1945

No private ownership of forests had been recognized until the last period of the Lee Dynasty (1392-1910) (10). "Mountain" in Korean usage is synonymous to "forest" or "forest land." Certain mountains such as "Granted Mountain," or "Keep Off Mountain," had been subjected to special protection. This practice resulted in the

so-called "ownerless mountain," which had been wastefully cut and cultivated for "fire-fielding" (a shifting cultivation on hillsides). Because of these abuses, most of the forests on the mountains had become devastated. The inaccessible forests along the Yalu and Tuman Rivers, the well-guarded forest lands surrounding or attached to royal tombs, and the like, were excluded. The excessive misuse of forest lands had exposed the underlying basic rock, which in turn had disintegrated by weathering and had washed down the slopes as particles. The normal industrial development and national well-being have been hampered through turbid floods under heavy rain, exhaustion of water resources, and drought damages.

In 1907, the old Korean Government created a forestry division in the Agricultural Bureau of the Agriculture-Commerce-Industry Ministry to rehabilitate and improve forests (11). Tree nurseries were established in Suwon, Taegu, and Pyungyang, and a reforestation plan was drawn up for the first time. The following year, 1908, the Bureau of Forestry was created in the Ministry to deal with all the forestry problems as the government system adopted was being revised. The same year, the Forestry Office System was adopted, and Forestry Offices were established in Seoul, Taegu, Pyungyang, Mokpo, and Kyongsung to direct reforestation and investigation duties and to encourage reforestation activities. Forest law, initiated in 1908, encouraged planting for protective multiplication of forests in general. Included was a provision in which private forest land owners were required to submit their records of forest land registration and become recognized. A brief survey on forest land registration took place in 1910.

In August of 1910 when Korea was forcibly annexed to Japan, this forestry organization was transferred either to the Japanese Government-General in Korea or to the provinces. The Bureau of Forests in the Agriculture-Commerce-Industry Ministry became the Division of Forests in the Bureau of Production of the Agriculture-Commerce-Industry Department under the Japanese Government-General. The Division of Forests was charged with reforestation, nursery operation, encouragement of rural forestry, disposal of government forest land, and similar responsibilities.

The Forest Law was abolished and the Forest Order enacted in 1911. This order specified the basic direction of forestry administration and introduced new systems on reserved forests, supervision of forests management, loans for reforestation, and disposal of government forest land not being kept. A survey on national forest demarcation was initiated the same year. In 1917, a survey for forest land adjustment was initiated, followed by a demarcation of national forest land to be kept or to be disposed of. The result of this survey was to become the basic data for management of national forests and for disposal of timber, as well as for protection and encouragement of reforestation. However, the survey and classification found that there were national forest lands which were related to lands under private ownership. In order to adjust this situation, the Order for Special Transfer of Forest Land was put into action in April of 1926; this disposal of the related forest lands began in 1927 and terminated in 1934.

For national forest lands to be kept, the National Forest Management Office was established for forests along the Yalu and Tuman Rivers. Branch offices of the Division of Forests were established for other major forest lands. Provincial governors were charged with the responsibility of managing the remaining forest lands.

In June of 1926, through government reorganization, the Department of Forests was created as the central office in charge of all forestry matters. This department was to take responsibility in the management of national forests and in the improvement of private forests. The National Forest Management Office and the branch offices were abolished and replaced by the National Forest Station, which was under the direct supervision of the Department of Forests. The station was subdivided into Forest Protection Districts. The responsibility for improving private forest lands remained with the provincial governors.

In July of 1932, in accordance with the reorganization of the government, the Department of Forests was again abolished and replaced by the Bureau of Agriculture-Forestry, which consisted of Divisions of Forestry Administration and Forestry, with the same responsibilities as those of the Department. In August of the same year, some of the National Forest Stations were discontinued, and national forest lands of the discountinued National Forest Stations were brought under the jurisdiction of the respective provincial governors.

Provincial governments, nevertheless, had difficulty in carrying out the double task of different natures, the promotional administration

on private forests and management of national forests, and this difficulty soon presented a lack of unity and coordination between the two. National forest lands under the jurisdiction of provincial governments were transferred back to the National Forest Stations in April of 1940.

As the responsible organization for national forests became efficient, a management plan was drawn up, a standard for cutting and planting was set up, protection personnel were assigned, and a protection order was issued to forest-residing people for an intensive prevention of shifting cultivation, illegal cutting, and other damages. On the other hand national forest lands to be disposed were leased to those who wished to use them for reforestation purposes. Those who succeeded in reforestation of the leased land were privileged to the title of ownership.

In order to make progress in managing national forests through exploitation, utilization and protection of national forest lands located along the upper streams of the Yalu and Tuman Rivers, and through guidance for shifting cultivation in the area, an exploitation program for northern Korea went into effect in 1932. For private forest lands, tree seedlings were distributed, exhibition plantations were established, memorial planting was practiced, a "love-forest" concept was aroused, reforestation was activated, and harmful insects were eradicated. Forest lands needed for management and public interests were designated as "reserved" forests for maintenance of forest covers. Erosion control work was implemented on the devastated areas in need of "governing water" (water regulation),

and the Erosion Control Order was promulgated in 1933.

Nevertheless, as this work was not successful, a 15-year plan was initiated in 1935. The outcome of the effort to make Korea green on the basis of national conservation and of "reserved" forestry was not very successful. The outbreak of the Sino-Japan War in 1937 put the economic organizations through readjustment; hence the direction of forestry in Korea changed from the greenification policy to the policy of becoming a military supply source. The directive on private forestry guidance of 1933 was basically revised, and a new standard for encouraging private forestry and a new plan for establishing timber forest in private forest-land were drawn up. These were put into effect in 1939. This change of direction, however, provided an opportunity for renovation in forestry in investigation for choice of tree-species in planting and nursery practices with major tree species.

The beginning of World War II in 1941 brought considerable damage to forests through increased cutting and disorderly extraction of pine resin to meet the military demand in the name of "Northern Korea Exploitation." In 1942, the Divisions of Forestry Administration and Forestry in the Bureau of Agriculture-Forestry were merged into the Division of Forest Products in the Bureau of Mining-Industry. Because of the fund shortage, erosion control work was drastically reduced in scale, and Erosion Control Stations were discontinued. The work was transferred to the Section of Forest of Counties but was limited to conserving cultivated fields for the wartime food

production. Each National Forest Station was put under the direct instruction of the provincial governor in order to facilitate an effective labor mobilization and supply under the wartime controlled economic system.

Forest Administration Since the Liberation in 1945

Once the oppressive Japanese policy on greenification and reforestation was lifted by the liberation, totally excessive and illegal cuttings rampaged. Consequently, forests were so badly destroyed or devastated at once that forests located near populated communities and on the plains were deprived of any forest products. As a consequence, this trend was extended to the relatively inaccessible forests. This ravaging was at its worst in the "reserved" forest land, and in private, temple, public, or national forests. The military government of the United States of America did not devise any significant measure against this forest destruction.

Later, during the transitional period, the urgent need for rehabilitation of these forest lands and protection of the remaining forests was recognized and reflected in establishment of the 10-year master plan for erosion control and reforestation in 1947. Forest protection personnel were closely supervised. Unfortunately, because of the continuing economic instability, social disorder, difficulty in obtaining materials for the work, poor quality of seedlings produced, and poor quality and shortage of field

technicians, the plan existed in name only. With the establishment of the Government of the Republic of Korea in 1948, the high ideal of "love-forest" was advocated, tree felling became strictly regulated, and the "plant-five-and-cut-one" policy was taken up to encourage planting.

Moreover, the production of peat as a substitute fuel was encouraged in order to conserve forest resources, and its use was propagated in large communities such as Seoul and Inchon. Peat digging was initiated in Kyunggi Province and Chulla North Province, only to be interrupted by the Korean War.

Since 1949, in nursery practices, the starting block in the reforestation course, guidance and encouragement measures have been taken up for production of healthy seedlings, and also for remedying the cause of the past failure in reforestation. The war provided no exception in this field. It was the same story with the national forests. The 10-year master plan establishing timber forests in both national and private forests under a systematic management met the same sad fate. Forestry work once again lost its right tract amid the administrative paralysis and social disorder caused by the War, with more destruction to forests.

Forest destruction was caused partly by direct action of war, and some by the increased demand for fuel and construction materials from the war refugee population. To some people, cutting was the only way to sustain meager life. This cutting even invaded stands of transplanted seedlings and saplings, so that one could hardly discover any stocked forest lands around populated areas in open

spaces and along roads. Thus, annual demand for forest products exceeded growth. Worse than this were the facts that rehabilitation of the devastated stands could not be expected, and that the threat of deforestation from these areas became a real menace. In 1951, immediately following the armistice, with the return and settlement of refugees and with the recovery of government functions, the Temporary Measure for Forest Protection was promulgated. In 1952, 1,110 protection personnel were employed to check stealthy and excessive cuttings. Meanwhile the Village Forestry Association (VFA) was organized in each farming village for autonomous protection and tending of forests in the village area.

The most urgent tasks for rehabilitation of the devastated forest land then called for establishing vegetation cover over barren land in the light of watershed conservation flood control and prevention of soil run-off. This need was materialized in the three-year plan for short-term quick reforestation; and in 1953 for attaining the earliest possible result, the following objectives were set:

1. Short-term quick reforestation.
2. Strengthening of Village Forestry Association (VFA) activities.
3. Peat exploitation and economizing of fuel consumption.

In the short-term quick reforestation, seedling or planting species of rapid growth even on barren land such as Lespedeza stipulacea, black locust, alder, pitch pine, and oak, was to be autonomously participated in by VFA members.

Village Forestry Association (VFA) activities were strengthened by establishing basic property and by increasing forest income. Since VFA members must be economically benefited, a measure was provided for establishing basic property through leasing or transferring a part of national forest land to the VFA, and this measure was implemented to increase income through increased production of forest by-products and special products. From 1953 a part of the erosion control work was implemented by the VFA and nursery production by the VFA was encouraged. In 1955 a government order provided that a private forest land might be entrusted to the VFA for its reforestation. In order for a just sharing of profit from the entrusted forest land, and for an increased income to the VFA, the regulation on compensation of expenses for the entrusted reforestation to the VFA and on profit-sharing was promulgated in 1957. Lease of the reverted forest land to the VFA has also been positively executed as the result of the reverted forest land adjustment act.

In 1955, the Division of Forest Products of the Bureau of Forestry was renamed as the Division of Forestry, and the Division of Forestry was to take charge of management of national forests. In accordance with the provision of the Temporary Measure for Forest Protection, the Protection Forest District was established over the nation for a strengthened protection of non-national forests. For the execution of the law the Ministries of Internal Affairs, National Defense, and Agriculture-Forestry took joint action. The year 1955 marked an important turning point in reforestation of non-national forest land and in erosion control. In reforestation of non-national

forest land, the pattern of government subsidy to reforestation underwent a change from "scattered" subsidy to "grouped" subsidy to VFA. The purpose of this reform was to eliminate defects of reforestation work of the past 10 years. The defects were caused by the facts that private forest owners were not zealous enough, but were rather forced by government pressure to reforest their own land, and that seedling distribution and transportation were troublesome and ineffective.

In 1956, an advisory committee was organized under the Ministry of Agriculture and Forestry to study the ways to improve erosion control methods as well as to reduce their cost. Erosion work was being implemented on large areas of open forest lands in groups along with reforestation and stream-channel works. Hillside erosion control work was divided into "A" and "B" classes, depending on the degree of devastation and slope; "B" class work consisted primarily of gully treatment and direct seedling, and this saved a considerable amount of cost.

In 1957, 18 major cities, including Seoul and Inchon, were put under a limitation of the quantity of forest fuel to be brought into them, while the consumption of forest fuel in rural areas was reduced through improving fireplaces. Thus the fuelwood forest establishment was given an impetus.

In 1959, the five-year plan for fuelwood forest establishment was set up, and tending of deciduous shoots, which were usually collected for green compost, was strongly recommended. In 1960, a forest survey by the sampling method was initiated, to be completed

by 1963 in order to provide the necessary data for planning an intensive management of national forests under the responsibility of national forest stations. In 1961, particularly after "The May 16 Revolution," the Forest Law and the Erosion Control Law were revised in accordance with the Revolutionary government's policy on adjusting old laws, and the Forest Products Control Law and the Hunting Law were also enacted and promulgated.

XI. EROSION CONTROL WORK

Approximately 400,000 hectare of denuded forest land are scattered on the upper watershed of the five main rivers (7). These lands play an important part in the development of Korean industry. A large quantity of soil and sand were washed down every year from those denuded areas. Those sands were piling up on the river-bed, making it higher and aggravating flood damage. Those rivers flow through approximately 8,000 km. (4,969 miles) in total, and by almost all agricultural land, houses and industrial installations. In addition to the flood damage, about 2,000 hectare of sand dunes have developed along the coastal line of the east and on Cheju Island. These dunes inflict damage of shifting sand and salt spray to agricultural lands and houses.

The most outstanding causes of forest denudation are poor forest resources to heavy populated areas, forest soil type from base rock of granite or granite gneiss, which is easily decomposed, and concentrated rainfall in the summer season. Erosion control work, which was started in 1907, continued through more than a half century. However, repeated social disorders and the Korean War became the main causes for spurring forest denudation.

To revegetate bare forest land, tremendous project funds have been invested every year, and engineering techniques for the revegetation to bring about maximum results with minimum costs is being urged. The erosion control work, based on engineering work in prime in the past, called for excessive cost. A less expensive

method, direct seeding and planting seedlings, which was practiced in 1960 and 1961, has shown no particular result in Korea, where the slope is steep, severe erosion is occurring, and the soil fertility is poor. Since 1963, these methods have been compromised; one method based on engineering work and the other with direct seeding. These combined efforts aim to gain a satisfactory result and to curtail expenditures. When the vegetations were seeded or planted in the work on an eroded hillside, and basic fertilization was applied, poor growth resulted and it was difficult to from ground cover. This condition has necessitated the implementations of supplementary work on the project area since 1965, to prevent at least redenudation. Supplementary fertilization is being planned for the area where erosion control work was implemented in the past. The work has been finished, although for several years it seems difficult to have the support of the government budget.

Most of the areas in need of forest erosion control are privately owned forest lands, located near the villages or farm lands. Implementation of erosion control work may be made by anyone on such areas according to the Erosion Control Law; however, it is impossible to carry out the work privately or by civilian organizations due to the tremendous cost of the project, because of the economic condition of Korea today and the high unit cost of the work. Therefore, the implementation of the erosion control project has to be made as public work within the government budget. Accordingly, the project is implemented by the Village Forestry Association, which is organized for rational management and protection of the forest. The technical

instruction and guidance is done by technicians of 47 erosion control stations throughout the nation, with the cooperation of the city and county project.

The time for the project implementation is as follows: direct seeding and planting seedlings in the spring; base work; engineering work, and stream channel improvement work any time of the year. The work in the spring has a good subordinate effect as a relief project for the slack spring season, and increased employment in the idle season of farmers. In 1964-65, a total of 32,000 M/T of U.S. Aid grain (7) was given out for wages to supplement the deficit of the wages in the government budget, as well as to give considerable relief to petty farmers. The cooperative management of the erosion control implemented area by the Village Forestry Association, and having the product after its management with the forest land owner prescribed in the Erosion Control Law, plus the policy of renovation of forest lands, made the people volunteer for the project implementation and its management. With the population increase, the agricultural land is being expanded for increased food production, and forest land is being converted to agricultural land. Therefore, there are conflicts in purpose in the field, because the Forest Erosion Control Law does not permit any disturbance of the forest where erosion work is being implemented. For such reasons, the Erosion Control Law was amended to turn over the central government authority, designation of the erosion control area, its lifting, and other such decisions, to the provincial governor.

This action stimulated the volition of the provinces to the project, and also made it possible for the provinces to implement their plans uniquely, adapting their particular situations for the best use of forest land.

Of utmost importance in an investment is evaluating its result. It is difficult to evaluate the effect of the tremendous investment to the devasted forest land, but the effect may be expected, though not in obvious figures, in plural factors; such as the state of devastation, the soil, the climate, the location, the numbers of houses in the area affected by the denudation, and the amount of agricultural land. In general, the effect can be shown in the following phases: (17)

1. Indirect Effect
    a. Preventing soil erosion and protecting agricultural land and other industrial installations.
    b. Building watersheds and preventing drought and flood damage.
    c. Increasing agricultural production by expanding farm land, and adjusting agricultural land through the regulation of water channels.
    d. Beautifying the scene by reforestation of the hillsides.
    e. Preventing damages of drifting sand salt spray.
    f. Increasing employment and providing relief for hunger.

2. Direct Effect on Production

   a. Providing fuelwood, timber, feed, compost, and wildlife.

   b. Assisting with the side-income of rural families through providing handicraft materials, such as lespedeza.

   c. Building up resources for honey production through planting black locust and lespedeza.

Forest erosion control is classified as to hillside erosion control, coastal sand-dune fixation, and stream channel improvement. Priority was given to hillside erosion control work in implementation from 1961 to 1965. This work aims to stabilize soil run-off at the upper watershed first, then to implement stream channel improvement for the best result of the project and greatest durability of the engineering establishment. A plan has been made to carry out coastal sand-dune fixation work and stream-challel improvement work at the same time beginning in 1966, to attain an overall effect in the erosion control work. Especially, the Forest Rehabilitation Seven Years Program (5), which started in 1965 for all-around and rational forest management, is well thought out for the speciality of forestry, which is a long-range program. Erosion control work is included in the plan, and the work planned is as shown in the following tables.

Table 5. Erosion Control Work

Year	Hillside Erosion Control		Stream Channel Improvement	Coastal Sand-dune Fixation	
	Area	No. of sdlgs.		Area	No. of sdlgs.
	ha	Thousand sdlgs.	km	ha	Thousand sdlgs.
1955	8,273	29,010	-	213	2,413
1956	7,300	-	328	109	-
1957	3,546	34,301	106	9	1,514
1958	24,000	31,285	109	338	3,230
1959	44,383	92,287	117	200	2,000
1960	78,418	123,173	62	240	2,068
1961	51,960	100,717	175	230	2,311
1962	31,886	55,595	9	200	4,000
1963	183,433	611,453	-	40	400
1964	114,890	136,652	-	-	-

1 km = 3,280 ft. = .621 mile

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 6. Erosion Control Work Plan Under Seven-Year Hillside Management Program

Year	Hillside	Stream Channel	Sand-dune
	ha	km	ha
1st year (1965)	76,699	-	-
2nd year (1966)	80,671	200	50
3rd year (1967	73,914	300	300
4th year (1968	44,199	300	300
5th year (1969)	20,736	300	300
6th year (1970)	50,072	300	300
Objective year (1971)	47,000	300	300

Forestry in Korea, 1965, by M.A.F. of R. O. K.

Hillside Erosion Control Work

Erosion control work is a project to directly seed the hillside, plant seedlings on a cut terrace, and to build engineering establishments such as check-dams. This drainage control and soil checking to revegetate denuded forest land is an urgent project for stabilization of soil on denuded forest land. It is very important to study various factors such as location of denuded forest land, topography, soil-type, and climate, synthetically, and to analyze and study the factors in order to design adequate and stable engineering establishments.

The principle of direct seeding in erosion control work is to choose a species of plant which grows well on denuded forest land, such as black locust, lespedeza, legumes, and grasses, and to strip-seed these plantings horizontally to the slope; however, spot-seeding is permitted by the conditions of certain sites. Respective inoculants are cultured and inoculated by black locust, lespedeza, legumes, and grass for the fixation of nitrogen from the air to aid in their growth on devastated forest land.

Seedlings for planting on denuded forest land have to be of a species of tree which has vigorous growth, such as black locust, alder, or pitch pine, and 5,000 seedlings per hectare are planted (7). Not only are the seedlings planted good for fuelwood and timber for rural people after the bare hills are healed, but also the black locust and alder are trees good for building fertility. Also, the grass directly seeded stops the erosion, and after the ground cover is well established, supplies compost and feed necessary for the farmer.

Stream Channel Improvement Work

A stream which has denuded the upper watershed area by washing its bank away, has built the stream or river bed higher, and has caused flood damage by the soil eroded from the upper watershed area. Engineering establishments and stream channel improvement work have to be accompanied by upper watershed revegetation; otherwise, the establishment cannot be maintained long. Therefore, stream channel improvement work has to be implemented in the area where the watershed area is cured; to adjust the width of the stream and its floor, engineering establishments such as bank enforcements, weirs and checking dams, are made to improve the function of water utilization.

The work takes quite an expensive investment; therefore, large-scale implementation at a time is difficult. Generally, one kilometer of stream channel improvement work is needed per 50 hectares of eroded upper watershed area.

Coastal Sand-dune Fixation Work

The coastal line of Korea is very irregular on the southeastern part, and many islands and islets have developed. For these reasons neither sand-dunes nor salt spray damages have occurred there. However, damages of sand-dunes, salt spray, and shifting sand are occurring along the eastern coast line, which is regular. Furthermore, the top-soil of forest land along the coastal line is being blown or drifted away. This loss of top-soil has

made the soil fertility poor and has inflicted severe damage to farm houses and other industrial installations. Therefore, the objectives of coastal sand-dune fixation work are to stabilize the coastal sand-dunes permanently and to prevent damages of shifting sand and salt spray, in order to protect houses, fishing grounds, and agricultural land. Consequently, the soil of the sand-dunes themselves will be improved for productive use.

Coastal sand-dune fixation consists of digging the planting hole, filling it with soil brought in, fertilizing, and planting salt-spray resistant tree species, under the temporary establishment of the sand-stabilization and the shelter-belt stands. Suitable trees are black pine, poplus Davidiana, Juniperus procumbes, Juniperus utilis, Rosa davurica, black locust, and Elaeagnus crispa (21).

Table 7. Average Flood Damage per Year

Kind of Damage	Unit	Total Damage Inflicted
Human lives	man	1,300
Livestock	head	14,000
Refugees	man	217,000
Cultivated land	ha	199,000
Electric poles	ea.	5,900
Road washed	place	15,000
Housing site	place	100
Soil run-off	M/T	300,000,000

Forestry in Korea in 1965, by M.A.F. of R.O.K.

XII. REFORESTATION

Collection of Seeds

Seed collection for forest use amounts to 800,000 kg per year (7), judging from the average amount of seed collected the last five years. These seeds are for nurseries for the national forests, for general nursery use, for nurseries for trees for special uses, and for direct seeding in erosion control work.

The most important and essential problem in seed collection is that the seed collected should be well matured. Also, it has to be collected from a tree superior in its inherited quality, fast growing, and of a good quality of wood. However, there is difficulty in finding ideal and outstanding forests for seed collection, due to destruction of superior mother trees through the Korean War and social disorders.

For immediate need of seeds for reforestation on nonstocked forest land, a survey was made throughout the nation from 1963 to 1964 to locate better forest stands as a temporary measure to supply the seeds needed. The survey found 144 locations of seed-tree forest to be designated in forested areas of national forests and of the provinces, where the seed collection and supply depend on the nursery work of the timber forest establishment (7).

The seed-type forest designated is an area more than one hectare per location with more than 500 stands of mother tree on the area (14).

Most of the designated forests are located in national or public forests, and a few in private forest lands. The species of the mother tree forests are larch, Korean white pine, cryptomeria, Japanese cypress, red pine, black pine, pitch pine, and a few others.

For establishment of seed-tree forests in the future, the Institute of Forest Genetics surveyed and found 118 plus trees from which to collect scions to establish 650 hectares of seed-tree orchard under a 10-year program (19). The seeds collected from the seed-tree orchard from scions of plus trees will produce 180 per cent approximately, more in quantity and quality than the collection from ordinary forest. This plan has good prospects of restoring devastated forest land and improving the quality of trees deteriorated at present.

Besides the seeds collected from the seed trees, a large amount of seed is collected for erosion control use, planting and direct seeding. The species are black locust, Korean alder, chestnut oak, lespedeza, grass and legumes. Also, chestnut, walnut, lacquer, oil paulownia seeds are collected for special use tree planting in particular regions adapted for their planting.

Nursery Operations

The nursery is classified in three groups as national nursery, Village Forestry Association nursery, and commercial nursery.

The national nursery produces about 15,000,000 seedlings and 18,000,000 transplants every year on the average at Seoul, at Kangnung, by the national forest stations, and at the national nuresery in Cheju Island (7).

In recent years, reforestation of national forests has been expanded to about 30,000,000 seedlings planted annually, which is only 50 per cent of the total requirement of seedlings produced by the national nurseries with their limited facilities. Therefore, measures are being taken toward establishing self-sufficiency of seedlings by gradual expansion of the nursery in that part of the national forest area adapted for nursery beds.

The quantity of seedlings produced by the Village Forestry Association is about 50 per cent of the total seedling production of nurseries. The original objectives of having the Village Forestry Association grow nursery stock has been to encourage the establishment of the Village Forestry Association's property to practice forestry techniques to stimulate attachments of villagers to forest management of the forest they have reforested with seedlings produced by their own hands, and to raise the cooperative spirit of management in forestry. The Village Forestry Association nursery grows seedlings of black locust and pitch pine; these are comparatively easy for nursery management.

To aid the Village Forestry Association financially for nursery operation, a part of the operation funds is subsidized by the government and a part is obtained from the loan of the

Agricultural Cooperative. Even though the result of the operation has not yet been satisfactory, because of lack of nursery operation techniques and cooperative spirit, on the part of the Village Forestry Association, which requires cooperative work, the seedlings are gradually improving.

Commercial nurseries are asked to produce larch, cryptemeria, Japanese cypress, Korean white pine, and alder, which are delicate to produce technically, to balance the seedling requirements. Commercial nurserymen have a good skill developed in nursery operation techniques through many years of experience, but their petty financial situation does not allow them to have nurseries well equipped, so that the planned number of seedlings are not produced when the weather is dry. Therefore, the nurserymen concentrated in nursery work to produce the planned quantity of healthy seedlings, one million seedlings per nurserymen is set to produce the minimum quantity. However, the present situation is that most of the nursery men are running the operation as their subsidiary business. It must be observed that seedlings are not an item to be traded freely at the market. Their production has to be planned according to the programs of reforestation and erosion control works. For such reasons, a minimum production limit has to be designated to certain nurserymen who meet a certain standard of qualification of nursery operation facilities required by the forestry law.

Reforestation Work

Korean forest stock is concentrated in the watershed areas of the Yalu and Tuman Rivers on the northern boundary of the Korean peninsula and Mt. Paektu. Unfortunately, our country has been divided into two by the 38th parallel since World War II. South Korea has large areas of denuded forest and less stock volume than originally, and an increased demand of forest products of the increased population; some people joined South Korea from the North, and other people returned from abroad. In addition to such abrupt increased demand, the Korean War and rehabilitation of the houses and industrial installations brought wood consumption prior to building forest resources. To the heavy strain on forest products, was added, destruction by forest pests, such as pine defoliator and pine gall midge. At the end of 1964, nonstocked forest land covered 750,000 hectares, 15 per cent of which is managed by the National Forest Station; the remaining 85 per cent is privately owned, or national forest land to be disposed of for private ownership in the near future (19).

Generally, national forest land is in the best fertility class, and has high capacity of yield; however, average stock volume per hectare is 33 cubic meters in ratio of 25 per cent conifers and 75 per cent hardwood and mixed stands, and shows very low annual growth (19).

Privately owned forest land generally is poor in fertility except in Kangwon Province and remote forest land of other

provinces. Forest stock volume of such poor forest land is 5.5 cubic meters per hectare hardwood or poor quality pines, due to stripping management of ages (19). Also, not only is the ownership of forest land excessively limited, but also, the forest land owner is not eligible to invest for reforestation economically.

Therefore, at the present stage, Korean forestry needs strong measures of artificial reforestation by the government for national land conservation and rebuilding forest resources on a long-term basis.

The policy of reforestation is to produce a greater quantity of wood rather than a better quality in order to cover the present need of timber resources, to increase the quantity of production per unit area, to reduce the period of timber production through planting the new variety of trees introduced by the forest genetic works, and artificially to regenerate nonstocked forest land and poor hardwood forest with useful conifers.

Government Plan

Artificial reforestation for artificial regeneration and reforestation on nonstocked forest land is aimed to be finished by 1986, and 746,000 hectares of fuelwood forest and timber forest, and 134,270,000 seedlings of hybrid poplar and special use tree planting is planned. Priority will be placed on fuelwood forest establishment through 1965-1971, which is "The Seven Years Program Reforestation."

When such a program is accomplished, the total forest stock volume will be 360,000,000 cubic meters in the year 2005, and the timber supply of 8,000,000 cubic meters per year then will barely reach the stage of self-sufficiently of timber (7).

National Forest

Forest land subjected to national management consists of 850,000 hectares, 277,000 hectares of which are coniferous mixed forest of red pine of superior quality, which is also easily reproduced naturally. Also, 387,000 hectares of hardwood forest and 11,000 of nonstocked forest land will be artificially reforested with larch, Korean white pine, red pine, fir, and other varieties.

Reforestation on forest land places emphasis on building timber resources for its land fertility; however, only 2,000 hectares were planted annually until 1962, which were expanded to 10,000 hectares from 1963 on. A supplement in personnel and budget to the National Forest Stations will be necessary in order to reforest nonstocked forest land and to regenerate hardwood forest artificially in the shortest period of time.

Privately Owned Forest Land

Private forest land, including disposable national forest land, occupies 87 per cent of the total land in Korea; however, it has very low productivity due to its poor fertility. Also, even though the forest land is covered, most of the trees are poor quality pines or hardwoods.

The problem of the reforestation program on private forest land is to reforest 639,000 hectares of nonstocked forest land, to raise the productivity of the forest land, and then to regenerate the present forest artificially. Reforestation on private forest land is classified as follows, according to the interest of the owners in the future objectives.

1. Establishment of fuelwood forest for rural areas.

The main reason for the devastation of our forest land is the tremendous quantity of fuelwood which has been consumed intemperately every year, and it is very difficult to secure fuelwood in certain areas of the country. In the ownership pattern of forest land, among 2,340,000 farmers, 1,510,000 are forest land owners (4). As 23.2 per cent of the forest land owners are absentee owners, supply of fuelwood was not done rationally. Therefore, for the fundamental solution of the fuel-wood problem of rural areas, and management of forests in other forest areas, fuelwood forest establishment is planned on forest land near villages, with fast growing tree species for sustained yield of fuelwood. The aim of the fuelwood forest is an area of 0.5 hectares per farm household, which becomes 1,170,000 hectares of fuelwood forest for 2,340,000 farm households (15). Of the planned area of fuelwood forest, 433,000 hectares is existing forest, 325,000 hectares have already been established through the period 1959-1964, and 412,000 hectares were to be established in the years following. This plan was to be carried out by the Village Forestry Association project with government subsidy and the product

in the future is to be divided by the ratio of two for the forest land owner, and eight for the Village Forestry Association.

2. Timber forest establishment.

Tree species for timber forest establishment are larch and Korean white pine throughout the country, and Japanese cypress, cryptomeria, and black pine for Cholla Namdo, Kyongsang Namdo and Cheju Provinces (14). Also, since 1962, hybrid poplar planting has been encouraged. Especially, the Village Forestry Associations, the Agricultural Cooperatives, the Poplar Association, the Poplar Center, and others show enthusiasm in planting Italian poplar (17). By the end of 1971 there should be one hundred million trees, although there is difficulty for concentrating the planting on one area (as it is adaptable for planting only in certain locations); however, when the plan succeeds, the problem of supplying the domestic demand of pulp and plywood material will be solved.

In addition to those trees, regitaeda pine (a hybrid of pitch pine and loblloly pine) (14), Pinus taeda, small-leaved Korean alder, and recently developed Suwan silver poplar are fast growing varieties, and those will be encouraged a great deal for quick establishment of timber resources, which is in such urgent need. Timber forest establishment today is promoted in two ways: reforestation with government subsidy, and reforestation with private funds. The former is being put on 20,000 to 30,000 hectares of the area annually; however, the work is gradually being turned over to long-term loan reforestation. For a trial of reforestation

with a long-term loan, 1,320 hectares were implemented in 1965, (15), but due to the insufficiency of the law and a lack of understanding of the ones doing the reforestation work, the trial turned out to be stagnant; therefore, the program will be improved.

Reforestation with private investment is about 10,000 hectares per year, most of which is done by those who are imposed by reforestation duty to replant on the area where they have logged. This consists mostly of tree planting on national forest land which has been leased and some other land. Handicaps of reforestation with private investment are a long term before harvest, a lack of capital, and bottlenecks in the management phase. Investment conditions are being improved by solving the problems such as handing out fast-growing tree species, loaning capital necessary for the work, enforcing the Forestry Law, and establishing a system of posting a forest guard by petition of the forest owner.

3. Planting special-use trees.

To raise the side-income of farmers, tree species which produce edible fruits and nuts, raw material for industry and handicraft, chestnuts, walnuts, oil-paulownia, and lacquer are planted. It is necessary for the farmer to plant those trees in order to gain more income from small agricultural land, for those trees start yielding faster than other trees and give high benefits.

Although the main species for this project is the chestnut, it is difficult to plant chestnuts north of Yongyang, Andong in Kyongsang Pukdo, Chungju in Chungchung Pukdo, and Chungchung Namdo, because of the spread of the chestnut gall wasp; therefore,

the grafted seedlings of pest resistant species are being planted since 1967. Improvement of the bamboo forest is needed, for 2,408 hectares of bamboo forest are mostly in the province of Kyongsang Namdo and Cholla Namdo, with such poor stands as 484 bundled per hectare. Again, an aim is set up to expand the bamboo forest annually to supply an estimated quantity of 200,000 bundles imported per year with domestic products (7).

Table 8. Reforestation Work

Unit: (Area: Hectare
(Quantity: Thousand Seedlings

Year	Reforestation Under Government Subsidy						Individual Reforestation		Total					
	National		Non-national		Total		Non-national forest		National		Non-national		Total	
	Area	Qunty.	Area	Qunty.	Area	Qunty.	Area	Qunty.	Area	Qunty.	Area	Qunty.	Area	Qunty.
1957	3,185	7,776	93,232	280,723	96,417	288,499	3,597	7,092	3,185	7,776	96,829	287,815	100,014	295,519
1958	3,412	8,571	128,712	319,971	132,124	328,542	4,139	4,599	3,412	8,571	132,851	324,570	136,263	333,141
1959	3,609	8,762	127,127	312,616	130,736	321,378	3,307	6,396	3,609	8,762	130,434	319,011	134,043	327,773
1960	2,497	7,330	92,318	167,309	94,815	174,639	33,946	69,842	2,497	7,330	126,264	237,151	128,761	244,481
1961	1,787	4,638	53,172	144,766	54,959	149,404	15,597	41,848	1,787	4,638	68,769	186,614	70,556	191,252
1962	2,495	5,144	107,417	374,373	109,912	379,517	15,044	223,122	2,495	5,144	122,461	597,495	124,956	602,639
1963	10,010	20,545	54,889	58,750	64,899	79,295	22,353	41,256	10,010	20,545	77,242	100,006	87,252	120,551
1964	10,168	20,013	108,461	313,308	118,629	333,321	45,257	53,770	10,168	20,013	153,718	367,078	163,886	387,091

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 9. Fuelwood Forest Establishment

Unit (Area: Hectare
(Quantity: Thou. sdlg.

Year	Reforestation area	Quantity by the Species								
		Black locust	Siberian alder	Japanese alder	Pitch pine	Black pine	Chestnut oak	Korean alder	Others	Total
1959	68,345	123,387	32,526	4,884	28,105	7,591	2,567	194	156	199,410
1960	76,157	34,351	22,352	3,336	39,603	17,495	22,348	3,358	-	142,843
1961	40,548	19,798	6,569	495	66,463	24,986	2,906	31	9	121,257
1962	84,938	190,753	38,697	25,852	54,739	7,352	11,033	-	7	328,433
1963	51	10	58	2	168	-	-	-	-	238
1964	55,590	211,993	35	-	200	10,000	-	-	-	222,228

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 10. Timber Forest Establishment on Private Forest Land

Unit (Area: Hectare
(Quantity: Thou. sdlg.

Year	Reforestation area	Quantity by the Species							
		Larch	Korean white pine	Black pine	Pitch pine	Cryptomeria	Japanese cypress	Other	Total
1957	21,962	11,457	1,163	14,904	38,683	1,843	475	465	68,990
1958	18,977	4,864	2,573	13,191	34,686	1,595	257	199	57,329
1959	34,430	60,715	4,417	5,934	21,237	5,451	1,430	119	99,303
1960	33,188	41,964	1,167	1,976	19,330	5,395	4,121	10,002	83,955
1961	15,439	35,539	3,520	635	616	2,334	185	-	42,829
1962	27,143	27,668	2,014	6,117	41,452	3,498	-	973	82,323
1963	21,457	18,990	2,247	13,589	18,462	959	1,172	5,573	60,992
1964	39,631	40,111	2,869	13,474	44,421	6,022	2,337	4,994	114,228

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 11. Timber Establishment on National Forest Land

Unit (Area: Hectare
(Quantity: Thou. sdlg.

Year	Total		Specification by the Species									
	Area	Quantity	Larch	Korean white pine	Black pine	Crypto-meria	Japanese cypress	Pitch pine	Red pine	Cork oak	Manchurian walnut	Others
1957	3,185	7,776	1,759	2,994	449	127	-	79	2,368	-	-	-
1958	3,412	8,571	1,307	5,091	751	451	169	160	636	-	-	-
1959	3,609	8,762	3,329	3,450	969	633	187	152	-	39	3	-
1960	2,497	7,330	5,422	931	573	201	80	85	-	32	6	-
1961	1,787	4,639	1,353	2,876	145	45	-	170	-	9	24	16
1962	2,495	5,144	2,588	2,035	309	-	-	160	-	28	-	24
1963	10,010	20,545	16,305	2,628	1,375	10	-	110	-	41	22	54
1964	10,168	20,013	14,577	3,218	1,292	482	137	192	-	94	-	21

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 12. Hybrid Poplar Plantation

Year	Area	Quantity Planted
	(ha)	(tree)
1962	236	135,000
1963	2,569	1,194,000
1964	11,294	6,636,000

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 13. Production of Special-Use Tree Species

Unit(Area: Hectare
(Quantity: Thou. sdlg.

Year	Reforestation area	Quantity by the Species									
		Chestnut	Walnut	Gingko	Persimmon	Wild persimmon	Oil paulownia	Paulownia	Ruth	Others	Total
1957	18,230	4,181	63	-	1,114	5,774	-	-	688	1,725	13,545
1958	30,884	6,822	527	103	1,953	5,202	714	74	734	2,609	18,738
1959	26,821	7,112	683	239	44	4,678	-	627	629	2,173	16,185
1960	16,918	7,666	273	94	286	538	23	-	-	1,473	10,353
1961	8,524	3,957	40	61	5	172	68	3	198	479	4,983
1962	8,974	4,662	45	21	228	438	65	1	-	126	5,586
1963	49,615	24,509	231	31	138	328	539	152	676	705	27,309
1964	47,192	20,362	824	23	8	-	1,324	41	1,324	52	23,975

Forestry in Korea, 1965, and 1962, by M.A.F. of R.O.K.

Table 14. Bamboo Forest Establishment

Year	Area	Quantity
	(ha)	(tree)
1961	157	128,000
1962	1,120	1,124,000
1963	614	626,000
1964	194	194,000

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 15. The Seven-Years Hillside Management Program (Reforestation)

Unit(Area: Hectare
(Quantity: Thou. sdlg.

Project	1965	1966	1967	1968	1969	1970	1971	Total
Total fuelwood	46,000	42,000	80,000	80,000	80,000	84,000	-	412,000
Forest forest	39,791	42,000	40,000	40,000	40,000	40,000	90,000	311,791
Bamboo forest	170	300	300	300	300	300	300	1,970
Total	85,961	84,000	120,300	120,300	120,300	124,300	90,300	745,761
Special use tree	12,420	10,350	2,300	2,300	2,300	2,300	2,300	34,270
Hybrid poplar	6,736	14,450	17,500	33,930	100,000	24,000	25,419	222,035
Total	19,156	24,800	19,800	36,230	102,300	26,300	27,719	256,305

Forestry in Korea, 1965, Ministry of Agriculture and Forestry, Republic of Korea.

XIII. FOREST PROTECTION

Protective Function of Forest

At present, and probably always, the physical and climatic influence of Korea's forests, and especially their influence on the prevention of floods and on the maintenance of water supply and soil conservation, will far outweigh their importance as productive forests. Fortunately, however, the management necessary to fulfill these protective functions is not incompatible with that necessary to fulfill the productive functions of providing wealth in the form of timber.

Whatever the policy may have been in the past, the practice has been to devastate and destroy and then to replace and repair. But the former is much easier than the latter. It takes 50 to 150 years to grow a tree worth having, and an hour to fell it. There has been felling in excess of the annual growth, thus slowly squandering the forest capital, followed by or combined with reckless lopping and litter removal. When a forest is destroyed, it can be repaired only at great initial expense, followed by years of care and probably at least one whole rotation before the original quality of the crop can again be grown. How much more sensible to manage the existing forest correctly! Fortunately, great though the damage has been, there is greater area which can still be saved at no direct expense by correct forest management.

Denudation run-off, floods, and erosion. Though it is true that probably not more than 10 to 12 per cent of the total land classed as forest is seriously eroded, the damage on that 10 to 12 per cent is very serious. And it is spreading. There is no information available to give details of the damage which can be caused by erosion, but certain facts are worth repeating. Normal erosion controlled by vegetative protection is desirable, or the parent rock would never form productive soil. But where the balance is destroyed and accelerated erosion starts, the results are wholly bad.

Springs and wells are fed by reserves of water stored in the subsoil. If the vegetative cover is removed, streams which were perennial will flood during rain, and run dry soon after rain ceases. Compare the streams in Kangwon Province where the forest cover is good, with those near Pusan where the hills are stripped bare. The former are perennial and the streams still run clear after 24 hours of rain, whereas the latter are intermittent and are almost liquid mud after an hour or two of heavy rain. Yet Pusan has a heavier rainfall than Kangwon Province. If the catchment areas are not kept covered with vegetation, and that means covered with forest over much of Korea, irrigation schemes that are dependent on perennial flow in the streams will dry up in the months of low rainfall.

The amount of damage done has to be seen to be believed. It is said that the farm population spends 25 per cent of its time collecting fuel and litter (20). When not engaged in other work, people

leave the small towns and villages early in the morning and swarm over the forest area hacking, lopping, raking, and scratching, and can be seen about 300 meters above the village level. Tiny children join in the destruction, each with his little A-frame.

Moreover, the results of the abuse are cumulative. A well-stocked forest catches the rain on its leaves, and the water drips gently to the ground or trickles slowly down the stem of the tree. Reaching the ground, it is soaked up and retained by the spongy mass of needles and leaves, and slowly penetrates the underlying soil, to be stored by the immense reservoir of the subsoil and gradually released into the streams. On bare soil the drops of rain tend to pulverize the crumb structure of the soil, which then disintegrates into small particles. The smaller pore openings in the soil become clogged by the infiltration of silt, and the soil-water mixture then tends to flow over the surface instead of percolating into the soil. The force of these raindrops is sometimes not realized, but everyone must recall having seen tiny pebbles supported by a small pinnacle which has been formed because the soil has been protected from the force of the rain by the little roof of pebbles. Nor is that the end of the story. The water flowing over the soil carrying small particles with its rasps over the surface like a file. As the abrasive power of a stream varies as the square of the velocity, double the speed, and the abrasive power is four times as great. But the carrying power varies as the sixth power of the velocity; double the speed, and the transporting power increases to 64 times.

Increase the speed 10 times, and the transporting power increases one million times!

As the forest cover is opened, the rain hits the ground a little harder. As it starts the pulverizing and deflocculation, the speed of run-off increases. The villager rakes a little litter, and the water runs off a little faster. Finally, all humus is removed, and the velocity of the run-off is further increased. And all these geometrically increasing abrasive and transporting powers come into play till the wonder is not the present state of the eroded areas in Korea, but that they are not worse.

A very wonderful effort has been made to check this erosion by terracing and by planting with grasses and trees. In most places the object of this good and expensive work has been lost by people felling the area when the plants were a few years old, often only seven or eight years, and before the crop had even closed, let alone formed any humus. Where it escaped felling, the results are phenomenal. In Chungchung Pukdo at and beyond Koesan on the road from Chongju to Suanbo, there is a large area of good forest where erosion control measures were taken 25 years ago, and where it is hard now to believe that the hills were ever bare and badly eroded.

Again in Cholla Pukdo on the road from Chongju to Namwon some five to ten kilometers before reaching Namwon, there is an area where erosion control measures were taken 25 years ago, which has escaped cutting except recently by the Red invaders. As far as the eye can see, the undulating hills are now forest country, and, although yellow patches of the old eroded soil can be seen in plenty, the

erosion is held and, so that the whole countryside has been reclaimed. Moreover, on the southwest side of the pass the bare hills were first terraced and reforested, and check dams and embankments were then put in to train the torrents. There is now a large area of rice fields where 20 years ago there was a sea of sand. The amended law makes felling in such areas an offense.

Steps should be taken to enforce the law especially rigorously on areas where erosion control measures have been taken. Felling should not be permitted till the areas have been included in an ordinary area of established forest, and certain trees allotted for thinning or felling in the general scheme for that forest.

Prevention of Illegal Cutting

Forest damage caused by human beings is defined in the forestry laws and regulations as stealthy felling of a tree, unauthorized logging, and over-cutting. From the old days there has been general recognition of the forest by the people in Korea. As forest land is owned by no one, this lack of ownership has caused lawless trespassing. However, years of autonomous guidance and strong legal measures for the prevention of trespassing have made it increase gradually. However, the autonomous protection system is not yet well arranged. For the completion of the system, positive promotion of extension and guidance methods are being studied. Especially, an outstanding result was brought about in preventing such human destruction to the forest by the Law of Controlling Forest Products

established after the 16th of May Revolution in 1961, which spurred on checking illegal forest products. The motive of the law is to root out such damages.

Eradication of Forest Pests

The typical forest pests are pine catepillar (Dendrolimus spectabilis Butler), Pine sawfly (Thecodiplosis pinicola Tavagi), and bark beetle (Myleophilus piniperda Line) (19). Recently the fall webworm (Hyphantria cunea Dnuy), the leaf rolling-sawfly (Acantholyda posticalis Matsumura), and the chestnut gall wasp (Dryocsmus kuriphilus Yasumatsu) have been spreading at a rapid rate, with considerable damages. However, the pine defoliator is the most destructive of all and is spread all over the nation, except in the most inaccessible areas. The pine sawfly had been limited to southern provinces, e.g., Chulla Province and Kyunggi Province. The Euproctis flava and the bark beetle, which once occurred widely, are now declining. On the other hand, the fall webworm, the leaf-rolling-sawfly, and the chestnut gall wasp, which could hardly be found in the past, have spread abnormally, and their eradication is urgently needed. Eradication methods currently employed have been mainly chemical spraying and hand-picking. The chemicals used are DDT, BHC, BHC-Malathion E20, and Dipterex E-50, of which the last two have been most effective. Muscardine fungus, a parasite to the caterpillar, has been cultivated and inoculated in the field, and this biological method of control has been very successful (4).

Forest Fire Control

Forest fires in Korea have not been caused by natural elements such as lightening, but by human elements, such as careless handling of lighted cigarettes in the woods and burning spread from "fire-field" practices.

Forest fire seasons have been spring (March to May) and fall (October to December) when dry air and strong winds prevail. During these seasons "Watch-out-for Forest Fires" periods have been designated with special measures for preventing and fighting fires. This has been semi-annual forestry events.

Table 16. Forest Fire Occurrence and Damage

Year	No. of forest fires	Area burnt
	cases	hectare
1959	63	240.25
1960	279	4,408.40
1961	353	6,020.12
1962	535	10,052.00
1963	291	2,650.00
1964	332	3,269.00
1965	971	19,962.00[1]

[1] Agriculture Yearbook, by National Agriculture Cooperative Federation.

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 17. Causes for Forest Fires

Unit: case

Year	Fires	Arson	Accidental						Natural		
			Unauthorized burning for cultivation	Burning for cultivation	Burning in woods	Cigarette light	Train soot	Others	Climatic	Spread burning	Others
1957	63	-	3	6	7	37	-	5	-	4	1
1960	279	0	15	-	9	187	-	14	5	36	13
1961	353	22	8	3	5	173	10	74	-	46	12

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Wildlife Conservation

Beneficial wildlife is usually the natural enemy to forest pests. Also, animals and birds are significant in the beautification of nature and in the improvement of national sentiment and health. For this reason a measure to protect and propagate wildlife population is necessary.

Tristram's woodpecker, Lorea's unique natural monument, is hard to be found nowadays, and the tiger, bear, fox, and wild boar and other game subjects, are decreasing in number or facing a state of extermination.

Therefore, positive measures are being taken to conserve and protect wildlife for the protection of forest and agricultural crops, to build natural science, and to improve the emotional life of the people and their health (19).

1. Sixty game sanctuary areas have been established over 2,150 villages throughout the nation.
2. To prevent year-around hunting, the hunting season has been set from October 1 to March 31 of the following year, and hunting licenses are issued to those who wish to hunt.
3. A protection area has been established for artificial propagation of wildlife and for surveying the wildlife population by kinds in order to study the protection method.

Designation of Reserved Forest

Reserved forest is set up by the Forestry Law on one million-odd hectares of forest land for national land conservation, prevention of damages from disasters and calamities, watershed management, maintenance of scenic areas, and multiple and efficient use of forest land. Individual functions of the reserved forest are set up as: prevention of erosion and soil run-off; prevention of damages from flood, wind, salt water spray, and snow; prevention of falling stones and fire; watershed conservation; provision of a fish habitat, maintenance of a nagivational park; and public sanitation and maintenance of scenic and historical places.

Without permission of the Minister of Agriculture and Forestry, cutting standing timber or branches, collecting soil and stones, tree roots, branches, resin, or bark, grazing, and reclaiming land for cultivation in the reserved forest have been prohibited.

However, the reserved forest lands of today have been largely continued from the Japanese days without readjustment. Therefore, the reserved forest today reveals a number of unreasonable points in its area, location, and management. To attain the effective goal of designated land to rationalize forest land use, location and its area, and to make adjustments for the objectives, the designation of reserved forest has been lifted for cultivation if the forest has not been necessary for continued reservation in 1964. The readjustment of status is as follows. Such adjustment work will be continued.

Table 18. Protection Forest District Establishment, 1960

Province	Seoul	Kyunggi	Choong-Puk	Choong-Nam	Chun-Puk	Chun-Nam	Kyung-Puk	Kyung-Nam	Kang-Won	Cheju	Total
No. of districts	9	213	46	149	55	203	166	195	82	47	1,165
Area of districts	4,052	63,984	23,159	43,727	94,653	88,063	60,852	57,712	35,917	14,525	486,644

Forestry in Korea, 1962, by M.A.F. of R.O.K.

Table 19. Reserved Forest Establishment (as of the end of 1962)

Kind of reserved forest	Number	Area in hectares
Prevention of soil erosion and run-off	250,602	745,751
Prevention of shifting sand-dune	1,552	1,656
Prevention of flood and wind damages	122	591
Watershed conservation	3,108	16,600
Navigational mark	3	9
Fish habitat	2,373	2,956
Maintaining scenery	7,843	13,478
Total	265,603	781,041

Forestry in Korea, 1962, M.A.F. of R.O.K.

XIV. FOREST MANAGEMENT

History of Management Until the Korean War

National Forests

The National Forests have been under systematic management for a considerable time. Before 1945, they were divided into compartments and there were excellent stock maps on a scale of one to 20,000 showing, by colors and symbols, a number of details such as species, mixtures, age classes, and so on.

The Pinus densiflora forests and mixed forests were mostly managed under a shelterwood compartment system on a rotation of 65 years, the seed bearers left being at least 25 centimeters in diameter. Some areas were clear felled and planted. Other rotations were 80 years for Pinus koraiensis in North Korea and 100 years for Quercus acutissima. Thinnings were made at 10, 25, and 45 years (20).

Larch plantations were apparently clear felled and replanted on a 40 to 80-year rotation for Larix kaempferi and a 70 year rotation for Larix koreana (20).

Areas of broad-leaved trees formed a separate working circle to supply firewood and charcoal, and were coppiced on a 20-year rotation. Formerly these broad-leaved forests also supplied railway sleepers, and were worked under the selection system with an 80-year rotation. There is also a record of certain broad-leaved sares being managed under a selection system with a felling cycle of

20 years and a rotation of 70 years, which sounds unusual and probably meant that an exploitable diameter was fixed corresponding to 70 years. Even then it is more usual to fix the exploitable rotation as a multiple of the felling cycle.

Provincial Forests and Vested Forests

The forests for timber production, mostly the pine forests or mixed forests, were usually managed under a selection system on a 20-year cycle, apparently under a rotation of about 70 years (20).

Forests for firewood and charcoal, mostly broad-leaved trees, were managed under a coppice system on a 20-year rotation.

Proper working plans existed for all the National and Provincial forests, each covering an area of perhaps 50,000 hectares, though naturally the area varied with local conditions, and might have been anything from 25,000 hectares upwards.

Private Forests

The private forests seem to have been under no properly regulated management, except that a certain number of mother trees were left when an area was clear felled. Provincial government control and systematic management seem to have arisen only when an area was already ruined and in need of special erosion control. The special erosion control work was then done systematically.

Erosion Control and Torrent Control

Work on erosion control began as long ago as 1907, but at first was limited to the neighborhood of cities and towns. Even then there were many other badly eroded areas, especially along the great rivers and in the south.

In 1922, the work was started on a larger and more systematic scale on private lands, with the help of the government. In 1933, the Ordinance for Korean Erosion Control Work was promulgated, and from then onwards the work was extended under proper plans, mostly along the rivers of Naktong Gang, Kum Gang, Han Gang, and their tributaries, though it was carried out on a lesser scale in many other places. The work decreased after 1942 because of the World War, but both erosion control and torrent control continued until 212,906 hectares had been dealt with (20).

About 1948, a survey was made of all areas needing special erosion control or torrent control. The areas were divided into compartments, details were entered into registers, and large-scale maps were made to illustrate the danger spots. A 10-year plan was to begin from 1949, but financial difficulties prevented this. The plan was modified in 1951, but because of the outbreak of the Korean War in 1950 and the consequent financial difficulties, since 1945 only some 23,184 hectares of eroded area have been repaired out of an estimated area of 444,649 hectares needing repairs, leaving 421,465 still to be done. During the same period, torrent control has been done over some 280 kilometers out of a total of

some 6,694 kilometers which need it. These areas needing erosion control and torrent control are alsmost entirely on private forest land.

After 1945, forest management deteriorated. All the Japanese technical staff were withdrawn. In the national and provincial forests the same systems of management were continued in accordance with the working plans, and so was the work in private forests under the plans for erosion control and torrent control. But liberty to many meant only license, and there was an orgy of illicit felling, especially in the private forests. This, unfortunately, included the erosion control area.

Then in 1950, the Korean War broke out. Many of the records were destroyed by the Red Army. There are left only an odd copy of one or two working plans, perhaps a dozen scattered stock maps, some erosion control and torrent control maps and registers in the provinces, and that is about all. There are places such as Wonju in Kangwon Province which have changed hands five times. The armies felled anything which suited them, nor did they bother to cut carefully. Often areas of poles were clear felled, leaving stumps three feet high. This was not without its effect on the indigenous population who needed little enough encouragement when it came to devastating the forest. With no plans, no records, and no stock maps or other maps in sufficient quantity, with a sadly depleted technical staff, with a population debased by the license of war, forests and forest management were bound to deteriorate further.

History of Management Since the Korean War (1950-1961)

Since the Korean War, forest management is designated as follows, but is without proper working plans to regulate and control it.

National Forest

Felling is on a selection system with an exploitable diameter of 18 centimeters. On one-third of the trees over that size may be taken from any one area, and there is the further overall limit of 900,000 cubic meters for all forests combined--a figure already exceeded (20). Areas which are damaged by fire, insects, and war, are clear cut and replanted as quickly as possible, the yield counting against the 900,000 cubic meters. Most broad-leaved areas remain unexploited for the moment.

Provincial Forest

The same selection system holds for the timber forests as for the national forests. The broad-leaved areas for fuel and charchoal continue to be managed, as far as is possible, under coppice with a 20-year rotation.

Private Forest

Theoretically, in the private forest nothing is felled except damaged trees, though silvicultural thinnings are allowed. Permits are issued for mine timber, telephone poles, and fuel fellings, and are supposed to be limited to the removal of pine trees exceeding a

a certain specified number per hectare. As the number to be left is, for example, 1,000 at a diameter of 18 to 20 centimeters, there can be scarcely any areas in the private forests silviculturally in a fit state for thinning.

The erosion control and torrent control plans still exist or have been remade. Once an area was declared as a special erosion control area, the Provincial Government, often subsidized by the Central Government, relieved the owner of all the costs of terracing, planting, and subsequent protection. After a period varying from ten to 20 years, the area was felled, the Government taking 70 per cent of the proceeds and the owner 30 per cent. This felling and subdivision of profits was to continue till the area was declared to be no longer an erosion control area. The system has, theoretically, continued till now, some areas being already in the stage of second felling, but no areas have so far been declared as being no longer erosion control areas. Actually, lack of funds, which entailed the closing of many nurseries, has caused this work also to fall into arrears.

The worst feature of the erosion control work is this early cutting, which has been much enhanced by illicit felling. Ten years, and even 20 years, is too soon. The money having been spent, the results have been largely lost. There are examples all over Korea where these areas have been felled only three or four years after the control work has been done, and hardly any areas have been left for even eight years. The crop has not

closed, and the raking of litter has prevented the formation of humus.

Control of Private Forests

Legal machinery exists for the Government to control the management of private forests in Law No. 10 of 1911 and Law No. 218 of 1951.

The various articles of those laws allow the Government to do all that is necessary for the proper protection and management of the forest. The work is to be done either by the Government itself or through the owner or a forest association (which can also be formed under Law 218) with the power to allocate the expenses and revenue.

Presidential Ordinance 58 of January 15, 1952, under Law 218, Article 4, designates the period for a Protection Forest as five years. Although management must be according to a plan sanctioned by the Ministry of Agriculture and Forestry (Ministry of Agriculture and Fisheries Ordinance 24 of May 14, 1952, Article 7), and although the period of five years may be extended (Presidential Ordinance 587, Article 4), and although the competent officials may inspect the management (Ministry of Agriculture and Forestry Ordinance 24, Article 7), these laws seem not to contemplate permanent management. If management is to have any real effect, it must be permanent and it must be management by a Forest Association, which is the most competent body to manage a forest, except that falling under the area classified as Village Development Lands. Under Law 10, however, there is power for

the Government to declare any area "reserved" for certain specified reasons.

At present, a total of 971,069 hectares are declared as protection forest districts.

Forest Industries

Felling and logging are done in the forest by hand, the trees being logged, as far as possible, to the length of the finished product, whether for poles, railway sleepers, or firewood. Where extraction is difficult, the logs are often rough squared in the forest to make transport easier. Export is done by man on A-frame, or by skidding to the nearest road in winter and thence by ox cart or motor lorry, and sometimes by floating the logs to the nearest consuming center or to the railroad.

A cheap form of extraction which might be tried, if not already known, is by "telescopic" floating. It is really a form of temporary wet slide. The material being exported is used to build a slide for a certain distance in the stream itself, so that it is continually wet. More material is then slid down, and this is used to extend the length at the end of the slide. When all the material has gone down, that at the top of the slide is picked up and slid down, so that the whole slide gradually moves downwards. It can be done on most rocky mountain streams, and is a good way of getting timber down the minor streams from remote areas to a stream where more orthodox floating can be practiced.

It must be emphasized that there is very little material which can be legitimately felled and exported from these forests at present, far too little to support mechanical logging and skidding with expensive aparatus. In Korea, where labor is cheap and where the winter labor for the peasant farmer forms a welcome addition to his income, it will be many years before machinery will compete with hand labor.

The main products needed are lumber, beams for construction, railway sleepers, telephone and telegraph poles, pit props (most important), veneers, plywood, and pulpwood. Other products needed are newsprint, paper and cardboard, boxes, furniture, carts and cartwheels (hardwood but mostly oak), turnery articles (alder, birch, poplar, willows, Zelkowa serrata, and when it can be obtained, box), matches and matchboxes (poplar).

There are 1.194 sawmills with a capacity of 24,474 horsepower in 1956. This facility possesses a lumbering capacity of 1,770,000 cubic meter per year, with an actual output of 677,816 in lumber from domestic and imported logs of 970,000 (4). In fact, a very large number of these mills are little more than cottage industries, often only a small wooden building in a yard with a circular saw to cut small scantling, possibly boxboards and fuel.

There are three veneer plants with a capacity of about 15,000 cubic meters at Pusan, Inchon, and Taegu. These also manufacture about 75 tons of soya bean glue.

There is a large paper pulp mill at Kunsan using Pinus densiflora for mechanical pulp, mixed with 30 per cent imported

pulp to make newsprint. With one machine working, its capacity is 450 tons of paper a month, and if the second machine is repaired, it will have a further capacity of 400 tons a month (20).

Present Management of Forests

National Forests

National forests are divided into two categories, i.e., the so-called national forest "to be kept" for national security, forest management, research and other public purposes, and the one "not to be kept." The latter forest is mostly scattered around farming villages and is of small size; and this forest land is disposed through lease, transfer or sale for establishment of agricultural forest.

According to the survey of forest land adjustment implemented in 1927, national forest land occupied 55.7 per cent of the total forest land area, but this included much of the devastated and treeless forest lands. Through the survey for forest land classification, the national forests to be kept and those not to be kept have been delineated. The latter had been leased to civilians as an encouragement measure for reforestation, and the leased forest might be given to him later upon a successful reforestation on the land. This disposal has been implemented since 1955 under the following three principles: (19)

1. The national forest land to be kept shall be directly managed by the government, and its disposal restricted.

2. The grouped national forest land not to be kept shall be leased to those who are capable of reforestation and management.
3. The national forest land of small size scattered around farming villages shall be leased to VFA (Village Forest Association) to be managed as village forest.

In 1961, it became inevitable that there must be a review and evaluation of the three principles on disposal of national forest land, because of the inactivity of the leaseholder against the second principle. Contrary to this, the third principle has been found to be very significant for establishing not only agricultural forest, but also fuelwood forest, with success anticipated; this principle is being positively implemented.

Private Forests

Private forest management is not developed as other industries are in Korea. For this reason, it necessitates a longer term investment of capital than that required by other industries. Due to limited protection of existing forest, national forest management seemed unthinkable, and it brought almost no profit from the forest. However, the interest of the people in the forest is gradually increasing, and with positive encouragement from the government, commercial forest management has reached the first stage.

Also by means of a profit-division contract, the Village Forestry Association can manage large areas of forest land under absentee-ownership in order to establish the forest and to increase profits.

In recent years, owners are particularly eager to plant Italiana hybrid poplar. Also, there is compulsory tree planting on cut-over areas. Those measures being studied will bring about development of the forest in the future.

Government Logging and Stumpage Disposal

Under the Seoul and Kangnung National Forest Stations, 37 management offices have managed 851,367 hectares of national forest land to be kept (19). National Forest lands are rather inaccessibly located so that the forest resources are well protected and tended. Exploitation of the inaccessible forest and effective logging should be implemented in response to the demand for domestic timber. However, civilian investment cannot be expected, as the exploitation will require an enormous amount of funds to build forest rails and other equipment, and as effective logging at a high profit cannot be expected. Because of these hardships, logging has been operated directly by the government, and the felled timbers have been sold. Standing timbers in the felling-designated stand where civilian investment would be easier have been sold for government revenue. Government logging and stumpage disposal have been playing an important role in regulating the supply and demand and the climbing price of domestic timber.

Table 20. Forest Land Area by Administrative Unit

Area Unit: Hectare

Cities and Provinces	Grand total	National Forest Land				Non-national Forest Land				
		Sub-total	Mangd. by M.A.F.		Managed by other government agencies	County agencies	Provincial, City and Private			
			To be kept	Disposal			Sub-total	Provincial forest	County forest	Private forest
Seoul National Forest Station	459,117	459,117	459,117	-	-	-	-	-	-	-
Kangnung National Forest Station	391,564	391,564	391,564	-	-	-	-	-	-	-
Seoul	20,844	4,405	472	1,260	2,673	16,439	1,125	1,125	-	15,314
Pusan	20,364	1,762	-	39	1,723	18,602	1,752	20	1,732	16,850
Kyonggi	605,420	65,042	2,736	46,011	16,295	540,378	40,590	29,029	11,561	499,788
Kangwon	684,628	26,635	-	11,943	14,692	657,993	85,681	28,024	57,657	572,312
Chung-Puk	588,754	88,157	242	74,322	13,593	450,597	68,983	15,138	53,845	381,614
Chung-Puk	527,096	36,858	326	28,836	7,696	490,238	36,377	5,742	30,635	453,861
Chun-Puk	476,076	45,421	168	40,160	5,093	430,655	29,915	12,923	16,992	400,740
Chun-Nam	790,571	63,060	377	26,052	36,631	727,511	33,340	9,507	23,833	694,171
Kyung Puk	1,294,255	60,769	1,380	50,832	8,557	1,233,486	121,789	15,388	106,401	1,111,697
Kyong-Nam	798,931	41,199	334	28,359	12,506	757,732	67,744	19,335	48,409	689,988
Cheju	135,307	29,677	25,629	4,048	-	105,630	14,311	440	13,871	91,319
Total	6,742,927	1,313,666	882,345	311,862	119,459	5,429,261	501,607	136,671	364,936	4,927,654

Forestry in Korea 1965, by Ministry of Agriculture and Fisheries, Republic of Korea.

Table 21. National Forest Land Leased

Unit: Hectare

City and Provinces / Years	1959	1960	1961	1962	1963	1964	1965
Seoul National Forest Station	15.5714	29.6719	16.5003	27.0522	13.3223	8.5408	34.0124
Kangnung National Forest Station	350.2223	244.2522	152.5811	269.3218	269.1514	231.7824	2.4029
Seoul	1.0305	2.5207	9120	2.5500	31.0621	23.5410	-
Punsan	10.6400	-	1.1000	-	28.8700	-	-
Kyonggi	13,910.9200	135.9611	300.4010	107.3719	398.9104	63.5300	58.1100
Kangwon	5,938.9600	564.7400	153.3600	2,723.0900	-	208.1900	-
Chung-Puk	19,207.1322	5,024.4110	3,701.9200	776,6500	215.6800	270.2900	5.7550
Chung-Nam	6,215.5423	1,455.0523	311.9100	801.9411	6,123.7100	677.3300	6.5700
Chun-Puk	3,933.7503	2,148.9727	12,350.6323	122.6900	700.4100	10,774.8300	19.9700
Chun-Nam	14,201.7427	285.9800	408.3500	1,526.5700	477.3000	-	637.1420
Kyung-Puk	8,153.4287	1,587.8200	1,607.0400	6.9400	605.2600	1,823.1400	853.0400
Kyung-Nam	10,043.8222	755.3315	404.9517	497.7900	2,369.2900	404.0400	-
Cheju	495.9808	188.3800	-	-	-	393.6327	1,343.8200
Total	82,478.8324	12,443.1214	19,409.6724	6,851.9519	4,77.8609	3,010.8313	3,010.8131

Forestry in Korea 1965, by M.A.F. of R.O.K.

Table 22. Government Logging

Year	National forest station	Implementation		Sale	
		Quantity	Cost	Quantity	Income
		m^3	Won	m^3	Won
1958	Kangnung	6,983	6,612,402	6,983	8,375,551
1959	"	3,598	5,049,793	3,036	6,500,000
1960	"	5,000	5,060,238	905	2,702,694
1961	"	6,000	6,106,795	10,545	38,540,990
1962	"	5,500	5,990,364	4,606	21,312,000

272 Wons = $1

m^3 = cubic meters

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Table 23. Stumpage Disposal

Year	General Timber		Pole		Cross-tie		Mine Prop	
	Quantity	Income	Quantity	Income	Quantity	Income	Quantity	Income
1958	44,198	4,799,978	280	70,202	9,525	981,100	2,003	237,200
1959	35,626	8,467,782	151	154,394	-	-	2,109	306,700
1960	50,149	12,343,364	1,070	700,000	3,754	685,000	3,970	1,156,238
1961	2,557	11,212,715	-	-	-	-	231	121,524
1962	3,014	6,123,110	-	-	-	-	279	276,950

Year	Mushroom Log		Fuelwood		Total	
	Quantity	Income	Quantity	Income	Quantity	Income
1958	5,482	634,157	9,751	807,544	71,239	7,535,182
1959	5,539	578,676	19,804	3,004,652	63,229	12,512,206
1960	5,638	1,022,190	26,241	3,099,346	90,822	19,006,139
1961	8,480	1,659,450	1,359	17,871	12,628	3,011,560
1962	11,240	3,792,828	208	575,671	14,742	10,768,599

272 Wons = $1

m^3 = cubic meters

Forestry in Korea, 1962, by M.A.F. of R.O.K.

XV. FOREST PRODUCTS INDUSTRY IN KOREA

Until 1945, the forests of North and South Korea were treated as one entity. The timber wants of South Korea were largely supplied by the forests of North Korea, but the forests of South Korea supplied considerable quantities of small timber and very large quantities of fuel. At present very little timber can be expected for any use except for scantlings, small poles, and fillings for 3-ply. For all that, the forests are potentially valuable. South Korea is typical forest country, and properly managed, its wealth would lie in its forests rather than in its agriculture.

Fanciful calculations are to be deprecated, but it is worth remembering that there are 6½ million hectares all classed as forest land, and mostly capable of growing at least third-quality forest of the local species. Much of it could grow something better both in quality and species. If the forest were properly managed under a rotation of 100 years and were now bearing, it might well be yielding enough to supply South Korea's present demand many times over, and there would be no erosion problem, no floods, and no lack of water. Surely forestry development is worth the effort. Even if it does take 100 years, many of the benefits will come within a few years.

Plywood Industry

A plywood plant was established in 1936, and has shown a sudden unexpected development. Recently, six plants installed up-to-date

machinery, and advanced techniques have enabled them to supply the military demand of plywood from 1958 and to export plywood from 1961. Hence, $12,500,000 worth of plywood was exported in 1964 (4). Due to the scant domestic wood supply, part of the logs for the plywood are imported from foreign countries. Although the profit does not exceed 25 per cent, the manufacture of plywood occupies an important position among domestic industries for its subordinate materials supplied domestically, its value as an export, and its aid in increasing employment.

Lumbering Industry

There are 1,532 saw mills with a capacity of 37,320 horsepower, and 1,179 circular saws. This facility possesses a lumbering capacity of 3,127,000 cubic meters per annum, with an actual output of 555,815 cubic meters in lumber from domestic and imported logs of 622,080 cubic meters in 1964 (4). To develop a sound lumbering industry, in December 1963, a standard of facility was set, and the permission system has been established to equip the lumbering facility.

Hard-board and Chip-board Industry

As for the development of the utilization industry, tops of trees, byproducts of lumbering, and refused wood, which have no value for lumbering, are used to produce hard-board and chip-board. A hard-board plant was founded in 1962, and production of chip-board began in 1963. The annual production capacity of the hardboard plant is 468,000

sheets, and that of the chip-board factory 724,000 sheets (19).

Cork Industry

The domestic cork industry in the past was very inactive, as cork stoppers were the only domestically produced product; most of the raw material was exported. However, since 1962, the export of the raw material has been prohibited in order to sustain domestic resources and to develop the cork industry. There are 20-odd small cork industries in Korea, which produce cork dust, cork board and carbonized board, in a mixture with imported Portuguese cork, to supply the domestic need of about 30M/T annually.

Kudza Bark Fiber Industry

There are 16 kudza bark fiber factories which in 1964 produced 158,545 rolls of kudza bark fiber wall paper. The same year, 129,833 kg of kudza were produced from which 117,774 rolls were exported, bringing in a revenue of $816,370. Most of the kudza bark, raw material for kudza bark fiber wall paper, is produced in Korea. To develop an overseas market and a home industry, export of kudza bark has been prohibited from the latter part of 1964, and wall paper has the prospect of becoming monopolistic export (19).

Forest By-products

Typical forest by-products are nuts, barks from cork-bark oak, mulberry trees, Edgeworthis papyrifera, and Diplomorpha trichotoma, resins from red pine and sumac, and mushrooms. Because of the

rising domestic and foreign demand for these by-products, the increased production has been encouraged as a means of improving the rural economy. Some by-products are supplied as industrial raw materials. Because of the limited forest resources, the encouragement to multiply them definitely occupies an important place in forestry enterprise.

The prospect for exporting chestnuts and walnuts has been very bright, and the economic benefit from these nuts is rising. In recent years, 1,320,000 liters of chestnuts and 223,000 liters of walnuts have been produced annually (7).

Barks from cork-bark (Quercus variablis), mulberry tree (Brossonetia kazinoki) Edgeworthia papyrifera, and Diplomorpha trichotoma have been industrially utilized. Multiplication of the latter two is needed due to the limited resources. Three-thousand metric tons of cork-bark had been collected and most of it exported each year until 1961, when the bark collection was restricted to 2,000 M/T to prevent exhaustion of the resource. And in 1963 it was planned to collect and supply 800 M/T for domestic use only.

As a protection measure in non-national forests, resin collection from red pine has been limited to the trees designated for felling, and the same practice will be applied to national forests. Although raw lacquer collected from sumac (Rhus sp.) has been domestically used for production of high-quality paint, and is expensive, the amount collected in 1962 was not much.

Edible mushrooms, particularly Pyoko and Kokyi, have been artificially cultivated on oak logs through inoculation. Not only

the profit from mushroom cultivation has been great but also the export prospect is bright. The five-year plan for the encouragement of production since 1957 has provided a partial government subsidy for the purchase of the inoculant.

Trade of Forest Products

Exports

The important items in forest products for export are forest by-products such as oak mushroom, kudza bark fiber, kudza bark wall paper, cork oak bark, a semi-finished product of cork oak bark, plywood, except logs. The proportion of the forestry items considered among the total exports of agriculture, forestry and fishery products was very minor because of the stagnancy of forestry exports; however, the export of forest products is gradually increasing with other export items under the export development policy set up by the government. In 1965, export of forest products brought $20,839,325 revenue, or 12 per cent of the total export value of agriculture, forestry and fishery products of the year. This was about 66 per cent larger than the 1964 record of $13,845,000 (17).

Such an increase of forest product exports in large margin was due not only to the export development policy of the government, but also to the fact that in 1964 the plywood export was doubled to that of 1963. Plywood export valued at $12,497,000, which is an extremely high ratio of 90.2 per cent of the total value of forest products exported, was made mainly to the United State of America.

Its sharp increase in 1964 was due to expanded domestic use in Japan, as the Olympic Games were held there (17).

Although the plywood industry in Korea has developed only recently, it has become an important export industry and has raised confidence in the United States, which is the chief market of the product, and the demand in the country is increasing. The plywood industry has bright prospects for increased production by the continuous securing of veneer logs.

Mushroom export value in 1964 was decreased $309,057, or about 58 per cent less than that of the previous year, of which $529,000 were from dried oak mushroom and from dried black mushroom (17). These were exported to Hongkong and other regions of South East Asia. Competing nations for the mushroom market, chiefly in Hongkong, are Japan, Red China, Malaya, and other nations. The export ratio of the nations to the market is 50 per cent by Japan, 20 per cent by Red China, approximately 20 per cent by Korea, and the rest by the other nations. The quality of oak mushrooms produced in Korea at the Hongkong market is higher than that of Red China, and a little inferior to that of Japan; however, continuous improvement of techniques in growing and processing the mushroom will supply the market with high quality products. Oak mushroom markets besides Hongkong are Singapore, Thailand, U.S.A., Vietnam, and Taiwan, in small quantity.

In the future, Korean oak mushrooms should develop a new market such as the U.S.A., where there is comparatively less competition, with revised standards of inspection for quality.

Table 24. Forest Products

Unit: U.S. Dollars

Item	Unit	1962		1963		1964	
		Quantity	Value	Quantity	Value	Quantity	Value
Oak mushroom and black mushroom	kg	36,919	375,335	26,758	335,384	168,048	528,906
Kadzu bark cloth	Roll	184,150	184,150	224,124	555,208	117,774	274,350
Kudza bark wallpaper	Roll	35,101	128,205	63,414	224,036	185,545	542,923
Rush cloth	Roll	-	-	-	-	1,500	2,250
Semi-finished cork product	M/T	184,900	184,900	-	-	-	-
Plywood		68,949,510	2,816,118	186,288,373	6,749,378	352,571,461	12,497,383
Total			3,688,708		7,882,006		13,844,912

Forestry in Korea, 1965, by M.A.F. of R.O.K.

Before 1964, kudza bark fiber was exported as raw material for wall paper to Japan, where it was processed and exported again as kudza bark wall paper to other countries. Since 1962, kudza bark fiber export has been controlled, but only the processed fiber. Under this policy the value of export in kudza bark fiber cloth in 1965 was $1,474,982; this value is 72 per cent more than that of 1964 (17).

It was due to the prohibition of kudza fiber cloth that the wall paper, which is the finished product, was exported from the second half of 1964. The market goes 35 per cent to Japan, 28 per cent to the U.S., and the rest to the European countries such as West Germany, Holland, Spain, and Norway. Present production of kudza bark fiber wall paper is subjected totally for export; however, there was a bottleneck for the production due to the need of funds to secure the raw material and technical guidance in order to improve the quality, but these problems are gradually being solved.

Imports

The greatest part of imports of forest products is log, and the rest is forest by-products for industrial use, and other raw materials, i.e., seedlings, resin wisteria, bamboo, wax from plants, raw rubber, bark, pulp, and lumber. Imports of these items in 1964 totaled U.S. $24,218,569, or $7,550,011 less than that of 1963, when the total was $31,768,580. Such a decrease is due to the policy of self-supply; that is, permitting import logs to furnish

raw materials when domestic materials are absolutely lacking. But a gradual decrease of reliance on imports is expected, as complete alternation with home products is under discussion. However, such a policy is difficult to apply in forestry, for Korean forest resources are short of raw materials for specific areas. This shortage makes it inevitable to import certain forest products.

In 1964, suppliers of the main forest products mentioned were the Philippines with $7,705,773 worth of logs, the U.S.A. with $5,871,784 worth of logs; other suppliers are Japan, Malaya, Borneo, and others (7).

Table 25. Dollar Expenditure for Importing Wood

Year	Expenditure (U.S.)
1957	3,000,000
1958	3,000,000
1959	6,300,000
1960	8,937,000
1961	8,378,00
1962	13,089,800
1963	31,768,580
1964	24,218,568

Forestry in Korea, 1962, 1965, by M.A.F. of R.O.K.

Supply and Demand of Wood

Wood is an indispensable material in national economic life, and a steady wood-supply signifies a perpetual economic growth and an improved welfare. Korea is undergoing a rigorous process of economic development; requires an effective policy for the supply of wood.

The domestic demand has been so steadily increasing along with the various construction projects and industrial developments ever since the Liberation, that the demand in 1962 was estimated to be approximately 1,600,000 cubic meters. On the other hand, stock volume has been estimated at 70,000,000 cubic meters, but most of it has been comprised of saplings, while the harvestable stock occupied only 10 per cent of the total volume. The big deficit is compensated by the imported foreign wood (7).

Therefore, the positive implementation of erosion control and reforestation work, along with the prohibitive measure on cutting, has aimed to provide a foundation for a perpetual self-supply of wood. Also, as a measure to reduce wood consumption, the use of substitite materials has been widely encouraged. With regard to the importation of foreign logs, a measure to secure overseas resources at an inexpensive price and for a considerable duration of time is being studied.

Supply of the domestically produced timbers has been limited in use to mine props, pulpwood for newsprint, construction, the exporting industry, and other specialized uses which can hardly be expected of the imported products.

Table 26. Wood Supply by Use

Unit: Cubic meter

Item	1958		1959		1960		1961		1962	
	Domestic	Im-ported	Domestic	Im-ported	Domestic	Im-ported	Domestic	Im-ported	Domestic	Im-ported
Mine props	78,100	-	177,500	-	196,970	-	234,087	-	150,500	-
Construction	-	-	-	-		-	3,235	-	26,000	-
Pulpwood	11,700	-	37,500	-	28,200	-	-	-	10,619	-
Ship building	-	13,200	-	10,712	-	9,650	3,000	2,359	5,410	2,831
Farming	-	-	-	-	-	-	4,943	-	11,000	-
Crates	-	-	-	-	-	-	-	-	22,166	-
Poles	3,100	58,541	5,200	1,831	1,070	1,703	60	1,150	2,000	-
Plywood	-	118,000	-	173,739	-	222,600	-	88,390	-	159,500
Cross-ties	-	150,000	18,000	38,000	3,754	15,820	-	18,090	-	3,987
Others[1]	65,100	81,200	175,880	185,663	227,587	245,983	35,595	228,441	47,010	423,682
Fuel	62,000	-	126,000	-	116,241	-	2,990	-	-	-
Total	220,000	420,941	540,080	410,045	573,822	495,756	283,910	338,430	274,705	590,000

[1] Uses for construction, farming tools and crate until 1960 are included.

Forestry in Korea 1962, by M.A.F. of R.O.K.

XVI. FORESTRY ORGANIZATION

Village Forestry Association (VFA)

As forests had been exploited of trees beyond an allowable extend with the widespread practice of stealthy and excessive cutting since the Liberation, an autonomous cooperation and understanding among people was recognized as the sole way to rehabilitation of the devastated forest land, to guard local forests, and to improve forestry in a sound and democratic fashion. Hence, the government had taken the initiative in organizing the VFA as a cooperative body of both forest land owners and local people to pursue common profits and benefits through forest management. The government in 1951 had encouraged an autonomous organization of VFA's in each village.

The Temporary Measure for Forest Protection had been the legal basis for the organization, and this Temporary Measure defined the VFA as a judiciary body. Intensification of VFA operations have been one of the three major forestry policies then. The Temporary Measure had aimed at the implementation of reforestation, erosion control, propagation of forestry techniques, economizing on fuelwood consumption, protection, and other various activities through VFA as the central force to the whole operation. Also, the County Forestry Association, the Provincial Forestry Association, and the Central Forestry Association had been organized to foster and guide the VFA's. The Forest Law of 1961 defined the organization of the County Forestry Association and the Federation of Forestry

Associations as judiciary bodies with provision for supervision, execution, and execution by proxy of management plans, profit sharing provisions, and tax exemptions.

The number of VFA's organized as of the end of 1962 is 21,468, with a membership of 2,383,586. These VFA's have been under the guidance of 159 cities (or counties) Forestry Associations; and the Federation of Forestry Associations has nine provincial offices (11).

Village Forestry Association Projects

Village Forestry Association projects under the cooperation of both local people and forest land owners are for mutual benefit. The projects include many phases of forestry, such as forest protection, reforestation, utilization of forest products, the entrusted forest management, and improvement of forestry techniques.

Forest Protection

Forest protection cannot be achieved by government enforcement alone, but requires the autonomous cooperation of the local people, i.e., VFA members. The VFA has established a protection system of patrolling for disclosure and prevention of illegal cuttings and forest fires, and has engaged in eradication of forest pests.

Rural Fuel Measure

In order to remedy the cause for forest devastation, the home "fireplace" has been improved to save fuelwood consumption. Also, the

VFA has established a fuelwood forest in forest land around or in villages through contributions of labor in which the VFA acted as the subject of the implementation.

Seed Collection

Seeds of black locust, oak, and other trees have been collected to self-supply the needed quantity for fuelwood forest establishment and other projects. The seed collected by the VFA has been purchased by the government, and this income has been a great help to the VFA.

Tree Nursery Operation

Seedlings of black locust, oak, and poplar trees, whose production is relatively easy, have been produced by the VFA to be planted for projects. The income from seedlings has been allotted for establishment of the VFA basic property.

Erosion control work undertaken as a national movement has been participated in by VFA members, and protection and management of the erosion-controlled sites have been practiced. Erosion control work planned for 1963 was to treat all the devastated forest land in need of erosion control, and the VFA was to take the initiative as the implementation force.

The Entrusted Forest Management

The place of the forest land owner or occupant who is not capable of reforestation, protection and management of the forest, the VFA has been entrusted with the management of forest land. Management operations have been executed by proxy, and the profit gained from the entrusted

management has been divided between the owner and the VFA.

Other Forestry Operations

To educate VFA members, various textbooks on forestry techniques have been distributed, and audio-visual means have been employed for the improvement of forestry techniques and for understanding of forestry implementation plans.

Other Organizations

Association of Korean Forest Products, Inc.

The Association of Korean Forest Products consists of 25 trading companies, dealing mainly with production of forest products. They have set up as targets of the association, to protect their right and benefits, to maintain dignity, to improve the method of implementing various projects concerned with the regulation of the national forest products disposition, to develop sound business practices for forest products, and to carry out the national forestry policy.

Korean Sawmillers' Association, Inc.

The Korean Sawmillers' Association consists of 72 sawmillers, aiming at sound development of wood industry through a steady supply of machineries imported, securing of timber and logs necessary for the members according to the government policy, and to promote further the welfare of the members and positive cooperation with the government policy.

Korean Poplar Association, Inc.

The Korean Poplar Association has been organized by 65 members who wish poplar reforestation. They aim to promote friendship and welfare and to encourage the people to plant poplar trees in order to make the country green and to build forest resources.

Korean Nursery Association, Inc.

The Korean Nursery Association has 192 nurserymen as its members. It has been established to achieve the objectives of a sound development of nursery projects, a cooperative autonomic spirit, and cooperation with the national reforestation policy.

Korean Plywood Association, Inc.

Six plywood manufacturers (17) organized the Korean Plywood Association to attain the objectives of assisting the supply of materials to the members, inspecting their products, seeking guidance and research of manufacturing techniques, increasing plywood and timber products, and coordinating supply and demand of the product, as well as advertising and spreading the products and promoting friendship.

Besides the organizations introduced, the Council of Measures to Korean Forest Resources has been organized for overall study of forest resources in Korea for sustained production to develop the forestry industry. And Korean Hunter's Association is organized to build the hunter's spirit, to eradicate wildlife pests, and to protect and propagate useful wildlife.

XVII. FOREST EDUCATION

At present, Korean forestry institutional education includes courses in agricultural high schools of three years, which require graduation from a junior high school, junior forestry colleges of two years, forestry colleges of four years, which require high school graduation, and the post-graduate course for the Master's and Doctor's degrees in colleges. Also, there are forestry courses in various schools which are not in the regular college.

Since 1945, the government, considering the importance and special location of Korea, has increased the educational institute of forestry a lot, and now offers a substantial education in forestry.

Besides the education implemented by the above regular educational institutions, the staffs of public agencies in forestry are trained and educated to improve their qualifications and technical practice by attending a training institute for a period set up. Trainees are sometimes sent overseas.

Table 27. Forestry Institution and Education Status

Kind of School	No. of Classes	No. of Students
Agricultural High School	95	4,994
Professional High School	3	156
Junior College	2	100
College	8	1,188
Master's Course	5	19
Ph.D. Course	-	4
Other Schools	1	34

Forestry in Korea, 1965, by M.A.F. of R.O.K.

XVIII. FOREST RESEARCH

Major Research Work

Most major research work has been done through the office of rural development in Suwon.

Breeding of Conifers

1. Research on Breeding Combination of Pines

The purpose of this research is to replace the native pines of degenerated quality with ones of better quality. A series of breeding combinations are made between species and between varieties to discover the superior combinations. As a result, the superiority of x Pinus rigitaeda has already been recognized, and this species has been produced on a large scale. Moreover, the results of the past five years indicate that x Pinus rigiradiata, x Pinus rigidarigitaeda, x Pinus rigiechinata, and x Pinus rigielliottii have been promising.

2. Trial on Establishment of Seed-Tree Stand by Controlled Pollination

The purpose of this trial is to distinguish the characteristics of x Pinus rigitaeda pollen by site, and to check the technical and economic feasibility of its mass production. This trial can be subdivided into four phases: (a) trial pollination by amount of pollens, (b) trial pollination by kind of pollination bag, (c) comparative study of pollens by the pollen-producing site, and (d) transplanting and reforestation trial.

3. Trial on Establishment of Seed-Tree Stand by Natural Pollination

The purpose of this trial is to establish a seed-tree stand by natural pollination through the selection of a suitable site for the parent species of x Pinus rigitaeda, for the ultimate goal of mass-producing the hybrid pine. This trial has consisted of the following four phases: self-pollination test, nursery practice for the male parent, flowering stimulation trial, and flowering suppression trial.

Breeding of Poplars

1. Research on Breeding Combinations of Poplars

In order to obtain poplars of faster growth, excellent quality and high resistance against diseases, the native species have been crossed with the imported ones (imported in the form of pollen and twigs). The purpose of this research is to determine the right combinations for desirable characters. Combinations among several dozen species are being made for the selection of individuals.

2. Trial on Pollination of Superior Combinations and on Selection of Superior Individuals

Poplars selected through combination trials and showing high vigor have been produced through pollination on a large scale; and those poplars have been planted in Suwon experimental plots, provincial tree nurseries and other places over the country, for observation and selection of superior individuals with desirable characters.

3. Research on Breeding Through Polyploidy

a. Research on Polyploidy Induction: To obtain triploids of

which the vegetative part shows faster growth, tetraploids have been induced by the colchicine treatment.

b. Investigation of the Desirable Characters of the Mutated Individuals, and Trial Production of Triploids and Hexaploids: The desirable characters of the induced tetraploids have been investigated, while the inducement of triploids and hexaploids have been tried.

4. Adaptability Tests of the Introduced Species

Various foreign species of good characters have been introduced and tested for their adaptability and their silvicultural feasibility; Poplus euramericana 1-476 and 1-214 have been found to be well adaptable to the Korean climate (19). These species have been encouraged for extensive planting.

5. Trial Establishment of Seed-Tree Stand Through Plus Trees

In order to supply seeds of good quality for reforestation work, 118 plus trees have been selected as a measure of forest tree improvement since 1959 throughout the nation. As the basic research for propagation, an asexual propagation of pines, which has been considered impossible, has been tried with successful results. Trials on the multiplication of the vegetative part of the tree have been continuously conducted, while efforts are being made to establish and designate seed-tree stands.

6. Soil Conservation Trials

a. Trial on Rehabilitation of the Devastated Forest Land:

This trial includes the establishment of vegetative cover on steep slopes, preventive treatment to avoid gully erosion, measurement of soil and water run-offs in the devastated forest land, and establishment of vegetation on coastal sand-dune areas.

b. Trial on Vegetation Improvement: The purpose of this trial is to discover the most effective method of soil and water conservation, as well as to improve the economic value of forest land of poor quality through the introduction of superior foreign vegetations. It includes trial establishments of grazing and farming areas.

7. Trial on Multiplication of Special-Use Tree Species

a. Selection of the Most Productive Chestnut Tree Strains and Trial on the Increased Production of the Nuts: Since 1961, cuttings of superior hereditary traits and high in disease-resistance and yield have been selected and collected from the noted plantations, to be used to establish cutting nursery stock. One hundred chestnut trees have been selected from 20 plantations throughout the nation, for final selection of the desirable individuals; and 12 varieties with high resistance to Bryocosmus kuriphilus have been introduced, and their performance checked.

b. Selection of the Best Sumac Species and Trial on the Increased Production of Raw Lacquer: Resin collected from sumac (Rhus sp.) is the raw material for lacquer, a

high quality paint; and the domestic production of 600 Kwans has not been sufficient to meet the demand so that 200 Kwans must be imported annully. Therefore, an increased production has been in order through the establishment of nursery rooting with selected individuals of high disease-resistance. From 1962, a five-year plan has been implemented for its research and trial.

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