Journal of Geography 25(1995. 2), 19-33.

# Spatial Pattern of Forest Land Degradation in Early Twentieth Century

Yoo Jeong Hwang*

< CONTENT >



**Key Words** : Forest Land Degradation, Environmental System and Sustainable Management, Deforestation, Accessibility

## I. INTRODUCTION

This study attempts to identify the regional pattern of forest land degradation in the beginning of 20th century and explain the factors involved to form this spatial pattern.

The environmental problems can be studied through the mechanism of environmental processes which are basically based on human and natural environment relationships. Many environmental problems man must face come from inappropriate human and nature relationship.

Historically, people all over the world have cleared forests. Clearing the forests is inevitable to make productive use of the land. In some countries, such as the UK, virtually all forest was cleared. Deforestation[1] was also extensive in the USA, which lost half of its forests between the seventeenth and early twentieth centuries.[2] The problem arises not just by clearing the forest itself but by inappropriate forest management which leads to land degradation. If clearing the forest is inevitable, and unavoidable, sustainable forest management should be explored in order to reduce the risk of land degradation. The Korean case suggests that forest management or deforestation has not been performed under control or under sustainable basis.

### 1. Environmental Processes

Every environmental management needs the understanding of environmental processes. Most of the environmental issues are brought by

* Lecturer, Seoul National University

excessively ignoring the environmental processes and by human oriented thinking. Man has continued breaking the balance between the environmental system and human system without acknowledging the consequences which can occur afterwards. Man has over-exploited natural assets upon which he depends for survival due to misunderstanding of the environmental system.

As the vegetation occupying in the forest is important in terms of ecological circulation or system, the clearing of trees, in other words, deforestation is critical to the environmental system. Following the environmental processes, bound together by clearing the forest. The removal of trees leaves the underlying soil directly exposed to rainfall which can be very intense, and has the potential to cause serious soil erosion. Unprotected soil can easily be dried up and become loose which is very vulnerable to soil erosion. The sloping areas of forest soils would be particularly prone to rapid erosion. Shallow soil layers developed along the slopes can be easily washed away, and in extreme cases, bedrock begins to be exposed at the surface. The slope face without loose soil or weathered material can not be the place where new seeds or infantile trees can grow. Meanwhile people may suffer from silting due to sheet wash erosion and continuous flooding in downstream as much of the rainfall immediately flows away and discharges to the channel. Therefore many studies show that at least 20 years is needed to recover and attain full-grown trees after reforestation. Furthermore, the soil profile development depending on climatic factors such as temperature and precipitation, needs much more time even after reforestation. Organic material supplied by vegetation and the weathered products from rocks can not reform the soil horizon quickly. Deforestation and concurrent demolition of the forest environment give the visible and longlasting impact to the whole drainage basins. Disturbed forest environment is not an easily recoverable environmental system and needs to be studied in the view of environmental management.

The environmental problems associated with deforestation like downstream silting and removal of the top soil layer, have been recognized and studied in the developed as well as in the developing countries.

It seems likely that there was a period of exceptionally rapid forest clearance in parts of Britain in the twelfth and thirteenth centuries. In recent years, soil surveyors have examined a number of hillside soil types in Wales. Superficially these appear to be quite typical brown forest soils but careful chemical analysis of the whole of their mineral profiles have shown them to be abnormally rich in sesquioxides. The implication of this is that the present-day soil may be no more than the lower horizons of a pre-existing soil and quite heavily podzolized one whose upper horizons were removed with almost catastrophic swiftness immediately after the forest cover was removed.

In Pakistan, the environmental problems associated with deforestation and overgrazing in the region have been reported. Much of the original woodland below about 2,000m has been cleared. Removal of the vegetation cover has led to soil degradation erosion particularly on the steeper slopes, Small rill and gully systems have developed up to depths of around 50cm. Soils are inherently susceptible to erosion on account of their textural and chemical characteristics. They contain little clay or organic matter for aggregation and possess

large quantities of silt and fine sand which can be easily transported by water. In the upper forested area above 2,000 m, which forms approximately 50 percent of the region, is affected by clearance-related erosion. The greatest area of erosion occurs on the mid-altitude slopes. It is estimated that up to half of this area has experienced soil degradation due to vegetation clearance. Vegetation clearance and cultivation in the uplands cause the problems of silting and flooding in adjacent lowland areas. Decreased rainfall interception and soils thinned by erosion of the upland slopes result in a more rapid runoff response to monsoonal precipitation. Evidence of silting is apparent in the sediment traps and flow structures such as weirs and reservoirs.

## 2. Regional Characteristics of Forest Land Degradation

Korean experiences regarding forest land degradation and reforestation need to be fully studied. As an initial stage, this study will focus on identifiable degraded areas and the factors involved causing the degradation.

Records about land slides and other natural hazards in the first half of the 20th century in Korea can not be merely regarded as incidents which happened by chance. Rather, the landslides and other natural hazards such as countrywide flooding are considered being resulted from the accumulated environmental abuses. First of all, the records surveyed in 1910 show that more than 40 percent of the national forests were either deforested or partially reforested with infantile trees. The situation of the devastation was even worse in private-owned forests. Only 32 percent of private-owned forests area had been covered with full-grown trees. These figures tell that the degree of forest land degradation was quite serious and any kind of measure needed to stop the demolition of the land to a certain degree(Table 1)(Table 2)(Table 3).

Secondly, a high degree of relief could accelerate the soil loss after soil becomes dried up by removing the vegetation.

Thirdly, seasonal concentration of annual rainfall also helped the soil loss leading to serious degradation.

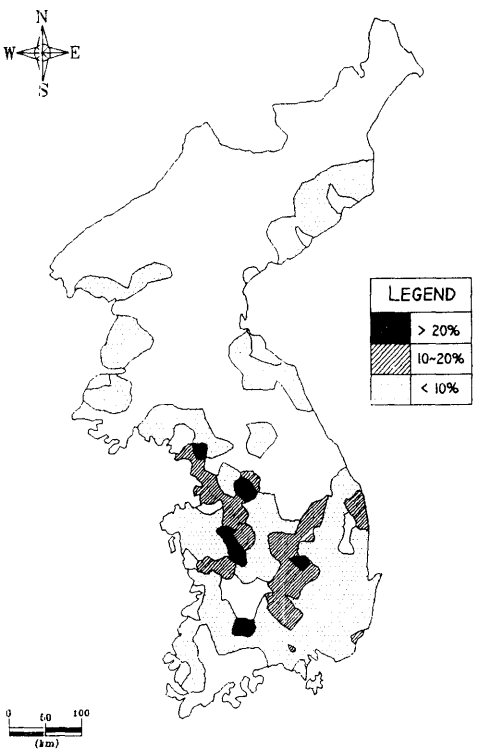


Fig 1. Degree of Forest Land Degradation

The problems forced the government to initiate the soil erosion control project. As a result of the project, 180,000 hectares of forest land were erosion-controlled and reforested during 1907-1935. The project reports describe

the degree of degradation such an extent that soil horizons been totally washed away and lost and even the remaining soils were deficient of the basic nutrient needed by plants to grow. These projects were first nationwide works done ever recorded on a local basis. Based on the project reports, the degraded forest areas can be identified and analyzed. The ratio of damaged or degraded portion out of the total forest area is calculated and the differential degrees of degradation are mapped by the Kun unit(Fig 1).

Careful investigation of the spatial pattern in Fig 1. represents the uneven pattern. The capital area and southern part of the country had been severely damaged. The northern part maintained a relatively stable condition. Mountains of relatively high sea level were kept untouched.

## II. CAUSES OF FOREST LAND DEGRADATION

What kinds of factors might have influenced the cause of this uneven regional pattern of forest land degradation by the spread of deforestation? Possibly several kinds of factors can be assumed with regards to geographical and geological aspects.

### 1. Population

#### 1) Population Growth

Population growth leads to the deforestation in two main ways: A rise in overall national population and local population increases, which may result from either inherent growth or immigration. Urban population growth leads to the deforestation in the immediate vicinity for fuelwood, building materials, and land for settlement. The official and reliable population record of Korea were published in Ho Ku Chong Soo and Dae Dong Gee Gee from 1666 to 1904. Steady increase is found between 1666-1807, while sudden decrease after the years 1807 and 1864(Fig 2).

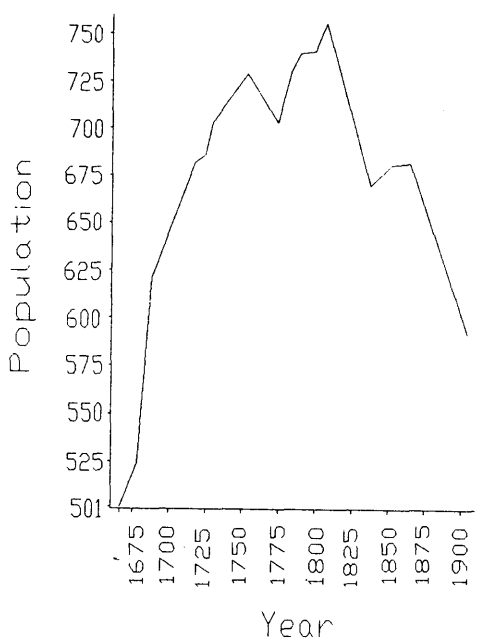


Fig 2. Population Trend

This trend points out that the national population increased from the mid-seventeen century to the early nineteenth century when political stabilization made possible to boost up the industries after foreign invasions, but the increase rate is less than 1 percent. Is it reasonable that national population growth of the 17th and 18th centuries can directly affect, to certain degree, the land degradation found in the early twentieth century? As timber was the only available energy source, more population needs a larger volume of fuel source. But

increase of population less than one percent could not seriously change the consumption of fuelwood leading to the serious forest land degradation. Furthermore during later part of nineteenth century, the population decreased due to wars, political instabilities, and famine.

Then can local population increase or immigration from place to place cause the region's degradation? Although very detailed population transfer or immigration data is not available, but population transfer should be minimal and can be disregarded because inducing factors to promote or to make population transfer such as industrialization or policies to encourage movement were not found. It's unjustifiable to assume that population transfer led to vary the degree of forest land degradation.

2) Local Population

The typical settlement pattern was developed in the rural areas of Korea. In that pattern the houses or the settlements were located at the foot of mountains facing rivers. Most of the small villages have developed at the above described spots. Farmers could collect the fuelwood from the forest just located behind their houses. If they used up all resources nearby in their communities, they had to make a distant trip to get the fuelwood. They had to spend quite a longtime to collect after the harvest to reserve the needed fuelwood for the long and harsh winter season.

They did not have special equipment to cut the trees or the efficient transport means. Once collected, they carried smaller pieces of wood with their backpack style wooden carriage. The carrying distance for their daily catch should be within walking distance if they considered the return trip in the night. If adult walking distance in a hour can be calculated as 4 km, the farmers could move within a 12 km range from their houses considering the difficulties to travel the narrow forest trails.

This settlement pattern leads to the next step analysis in which specified local population is compared to local degraded degree. In detail, the population per one hectare of forest land can be correlated with the degree of forest land degradation. To find out the relationship between the degree of degradation and the population ratio, which means how many people depend on one hectare of forest land, the correlation analysis has been conducted by SPSS(Table 4), which determined that there is not much dependency between the two variables. Local population depending on the local supply was not the main reason for causing a different degree of local forest degradation.

Table 4. Correlation Analysis

| Variable | Cases | Means | St.Dev. |
|---|---|---|---|
| Degree of Degradation | 107 | 6.45 | 5.73 |
| Forest Area/Population | 107 | 1.77 | 0.89 |
| Correlations | | -0.0176 | |

3) Population Concentration

The regional concentration of population like local administrative or commercial centers might be related to the regional differences of the degree of degradation. The distribution of local centers were overlaid on the Fig 1. representing the degree of land degradation by GIS(Fig 3). In the map, affected zones by population concentration which had greater than 5000 population are differentiated by the different radius size of the circle. It was observed that the agreement between the local center buffering zone and the degraded area is

41%. The damaged area coincides with the zones which were more populated than others. The locations of large centers, including the capital and major local administrative places, decisively had an effect on the development of differential degree of forest degradation.

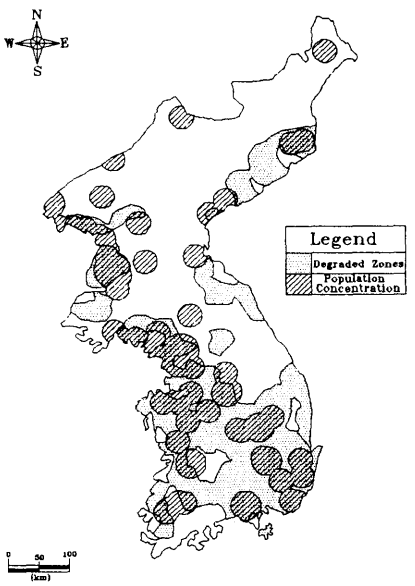


Fig 3. Local Population Concentration are overlaid with Degree of Forest Land Degeneration

## 2. Landownership

National forest dominated regions were relatively free from forest abuse, while private-owned forest dominated regions were heavily demolished.

In terms of the ownership of the forest land, national forests predominated the north, but private-owned forest dominated the south(Table1 3,4), Since there have not been enough studies conducted for the developmental history about the regional pattern of forest land ownership, the pattern of landownership can be assumed from the location of the capital city 'Hansung'. With the establishment of the new dynasty in the 14th century, the middle part of the country became the center for politics as well as the economies. Private land ownership was strictly prohibited in the beginning period of the new dynasty. However, strict land ownership law became ineffective with the increase of the Royal grant to the ruling class people. Those royal families and the ruling class people preferred to reside in the middle part of the country. They also preferred to own the land not far from the their residence and prefer to own the familiar areas rather than the remote, the unfamiliar areas.

Mountains in the middle and southern part of country are relatively less rugged and low level compared to those of the northern part of Korea. The physical distance from their residence and the more favorable landscape, in other words, less rugged low level mountains appealed to private owners predominately in the middle and southern part of the country. Once they owned the land, the land itself could be inheritable from generation to generation with a few exceptions. Therefore, the land ownership pattern based on the surveys conducted in 1910 can be regarded as having evolved for long period of time. More studies are still needed to verify the reasons why private-owned forest have been heavily damaged.

## 3. Capital City and Forbidden Mountain Policy

The serious demolition of the middle part of the country might be explained by the location of the capital city and forbidden mountain policy. The degraded pattern shown in Fig.1 represents that the Kyunggido regions have the highest figures in terms of demolition rate of forest land. The capital city, Hansung, has been

established as the largest city and population concentration area since 1394 when the new dynasty was founded. The two largest cities over 20,000 (1789 record) Hansung, and Gaesung were located in Kyunggido. After establishing the new dynasty in 1394, they made a strict law prohibiting entry to the mountains which were located inside Hansung City boundary. The reasons for instituting the forestry management law can be explained in several ways. First, they found severe degradation and deforestation after the Mongolian invasion. Second, the founders of the new dynasty wanted to show symbolic authoritarian meaning to set up the new capital by preserving the dense forest around Hansung. As Hansung should conserve the ti-chi, life-force to become a prosperous county, people had to plant and conserve the forest, rocks and soils there.[3] They designated it as Keumsan which means forbidden mountains the people could not enter. Surrounding mountains located inside the city boundary of Hansung any type of land use was strictly prohibited. Since the emperors of Chosun were much concerned about conserving the forbidden mountains, those areas had been well maintained and managed. But later periods with the ease of power and political instabilities, the people began to abuse the forbidden lands.

There city dwellers in Hansung had to purchase their needed wood in the markets which regularly used to be set up around the City boundary. Especially, the fuelwood had to be transported from various parts of the country. The social problems coming from the monopolization of the fuelwood by the merchants were recorded and the sudden price increase caused complaints. Until the railway opened in the early twentieth century, the volume of land transportation was very limited as a nationwide network of roads was not developed and they could only carry the commodities by cattle and horses. Waterways by ferry boats were the important routes that connected the centers and surrounding areas. Heavy loads such as logs, rice, and salt depend heavily on water way transportation.

The forbidden mountain policy in Hansung seemed to widen the possible degraded area up to the whole central regions neighboring the capital. Those neighboring areas were the highest degraded zones. Though the forbidden mountain policy, more or less, was conserved within the capital area itself instead the adjacent, neighboring areas were damaged, and suffered from forest abuse.

### 4. Industrial Location

Even though the industrial activities operated on a small domestic factory level, timber was the main energy source for the industries. Coal and oil had not been available to supply the energy needed by industries until early twentieth century.

Major mass energy consumption industries would be porcelain manufacturing, salt production, and wooden craft production. Industrial activities were very limited at the local supply level before the 20th century.

Porcelain manufacturing for the royal family and the upper classes were centered in Kwangjoo. Around 1910-1920 porcelain makers expanded to the Yeojoo, Ichon region. Supplies for the common people's need were accommodated by the production of local makers. In Kwangjoo records tell that fuelwood needed for porcelain making was supplied within the region. The timber producing woodland next to porcelain factories was well

maintained and supervised by local government forestry officers. The tree cutting area and the reforested area being designated every year. Therefore, the Kwangjoo region was relatively well maintained without heavy damage but the Yeojoo and Ichon region were heavily damaged. Since porcelain making boomed in Yeojoo and Ichon after 1910, it is hard to consider porcelain production as a crucial reason for the demolition in Yeojoo and Ichon.

Salt production: More than 40 percent of the amount of salt was produced(1907-1911 record) around coastal region like Mooan, and Booan in the Jeonnam region.[4] About 20 percent of the volume was made in Kyunggido such as Namyyang, Kanghwa, Boopuyung, and Inchon. Records tell that needed fuelwood for salt production was supplied by local areas.[5] The study regarding Bongsan-a sort of forbidden mountain shows that despite the strict laws limiting the access to the mountain without permission, unlawful tree felling was committed by residents and firewood merchants. The degree of land degradation was not so serious in Mooan and Booan while in Kimje Jeongup, Kwangjoo shows a higher degree of degradation. In Kyunggido, coastal regions like Kwanghwa, Kimpo, Hwasung were quite seriously degraded. With limited references, it is difficult to judge the major degradation factor in the coastal regions of Kyunggido. These regions are also within the affected boundary of Capital Hansung which totally depended on the resident's fuelwood supply from the neighboring areas because of the forbidden mountain policy. The salt production and the supply of fuelwood to the capital city of Hansung, both seemed to contribute to the deterioration of the forest in the coastal regions of Kyunggido.

Wooden craft producing was centered in Namwon which shows the highest degree of degrading. But more supporting references need to explain the most influencing cause that lead to serious land degradation.

## 5. Poverty and Landlessness: Slash-and-Burn Field

Landless people migrated from cities or other rural areas to clear forest simply to grow enough food to survive. Poverty and landlessness, the deforestation associated with them, are likely to remain problems.

Slash-and-burn field : frequent wars, political strife and heavy tax burden made people to move to remote mountain regions. They burned the forest to make fields to cultivate. Once the burnt field lost the soil fertility, they had to move and burn the forest again.

Table 5. Slash-and-burn population

| | Area (Jeongbo) | Population | Area/ Population |
|---|---|---|---|
| Kyunggi | 2,686 | 16,450 | 0.16 |
| Chungbuk | 2,075 | 16,009 | 0.12 |
| Chungnam | 52 | 1,358 | 0.03 |
| Jeonbuk | 1,289 | 27,578 | 0.04 |
| Jeonnam | 2,544 | 26,427 | 0.09 |
| Kyungbuk | 1,470 | 15,709 | 0.09 |
| Kyungnam | 218 | 4,842 | 0.04 |
| Hwanghae | 14,085 | 57,637 | 0.24 |
| Pyungnam | 41,107 | 111,628 | 0.36 |
| Pyungbuk | 111,665 | 278,266 | 0.40 |
| Kangwon | 56,451 | 205,037 | 0.27 |
| Hamnam | 85,197 | 248,731 | 0.34 |
| Hambuk | 5,864 | 48,593 | 0.12 |
| Total | 324,704 | 1,048,265 | |

Source: Chosun Chongdokbu, 1926, Hwajeon Hyunsang.

According to a 1926 record, the population of slash-and-burn field was estimated more than

one million(Table 5). It was around 5% of the total population at that time. Even in the 19th century, it is estimated that same percentage of population lived in the mountains as slash-and-burn field residents. They concentrated in northern part of the country. Larger areas per capita such as Pyungbuk, Pyungnam, Hwanghae, Hamnam can be explained as poor crop productivity due to a short growing season. Therefore they need larger areas to subsidize the family than the southern people. It is assumable that slash-and-burn fields contributed a lot to the cause of soil erosion on the slopes and lead to land degradation in the forest. As the northern part of the country was less populated as compared with other regions, the land degradation degree was much lower than the southern or middle regions.

## 6. Ease of Access

The spread of people and farming techniques into forested areas was influenced from the ease of access by roads and rivers. Roads were still underdeveloped and narrow so rivers often remained the chief means of transportation.

Studies show that major commodities such as salt, fuelwood, logs, and rice had been transported through waterways.[6] Taekrigi written in 1714 describes the usefulness of the Han River as a waterway and explains the commercial function of the Han River and its tributaries. Along the tributaries many landing piers became prosperous population concentration centers due to the large volume of commodities exchanged and traffic flow. Such landing piers on the Han River were Choongjoo, Wonjoo, and Chooncheon. Waterways acted as major human, commodities exchange route until land transportation acted as a major exchange network. Another study shows that major centers along the Han River from upstream to downstream were Choongjoo, Yangpyung, Yeojoo, Eumsung, and Wonjoo.

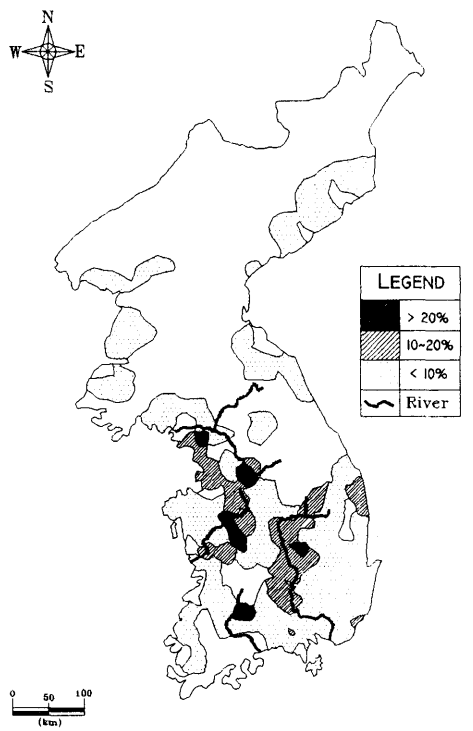


Fig 4. Major River Channels are overlaid with Degree of Forest Land Degradation

The map showing major rivers such as the Han river, Nakdong River, Keum River, and Sumjin River are overlaid with the map showing the degree of forest land degradation(Fig 4). The major drainage network pattern apparently suggests the implication of clues to connect the differential degradation found in Fig.1. The highest degree of degraded regions such as Namwon, Seonsan, Yeojoo, Yeongi, and Ichon. are mapped with passing waterways next or within the boundaries(Fig 5. a, b, c, d). The common feature found in these highest degraded regions is a drainage network interwoven zone. These areas have very good

access to the major river channels, which used to be the important waterways to transport the commodities. Those areas seemed to provide the needed fuelwood not only for their nearby communities but for the remote areas if they could not be self supporting within the regions.

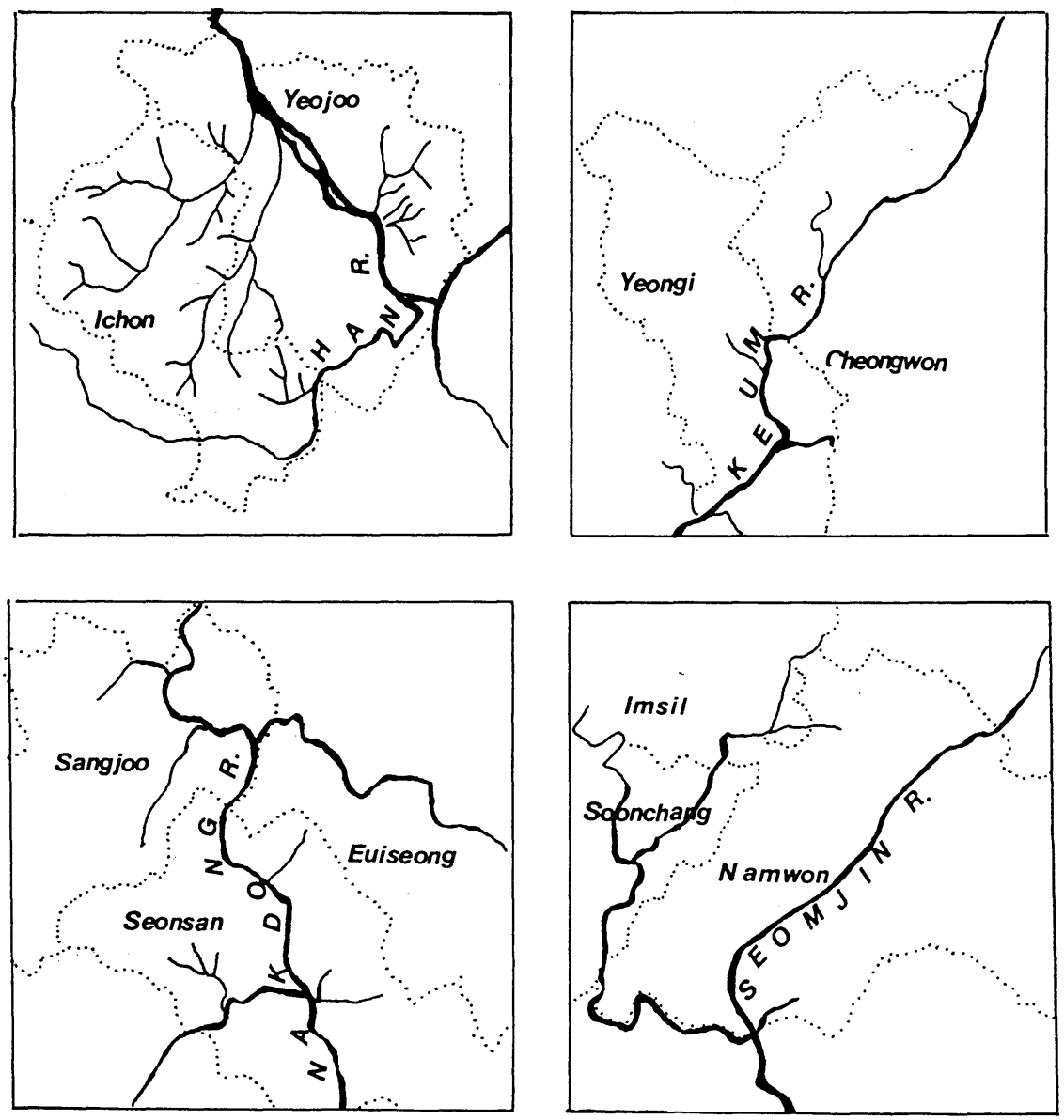


Fig 5. a. Han River and Yeojoo, Ichon Kun
b. Keun River and Yeongi, Cheongwon Kun
c. Nakdong River and Seonsan Kun
d. Seomjin River and Namwon Kun

The easy access to the major river network provided the opportunity to be deforested and accelerated the devastation in the case of flooding.

### 7. Physiographical Factors

Physiographical factors such as topography and base rock also influenced the spread of forest land degradation, but in less predictable ways. Lowlands should ideally be more attractive for deforestation than hilly areas.

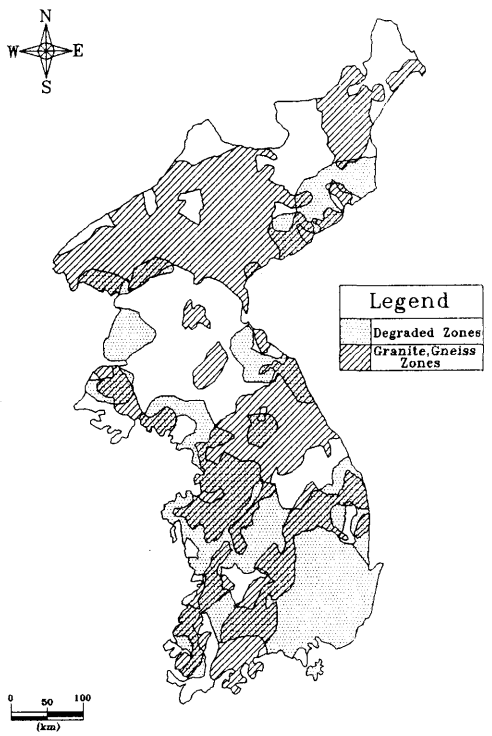


Fig 6. Distribution of Granite, Gneiss are overlaid with the Degree of Forest Land Degradation

The areas corrected by erosion control were identified in the maps prepared by the project organizer. Those areas are adjacent to or at short distance from the arable land and the sea level ranges of 100-400m.

The distribution of granite or granite-gneiss was overlaid on the Fig 1. representing the differential degree of land degradation(Fig 6.). The study on the liability to dilapidation according to the baserock proves that the granite and gneiss distribution areas cover broad barren naked areas.[7] Those areas could be very vulnerable to be degraded in case of exposure as vegetation disturbed areas. The northern part of the country, even the area with granite and gneiss was relatively free from the degradation, while the capital area with granite and gneiss was quite heavily degraded. But, the southeastern portion of the country had been degraded quite seriously nothing to do with the granite and gneiss distribution. Therefore, it is not acceptable that the baserock was crucial factor to determine the degree of forest land degradation or the possibility to be degraded.

## Ⅲ. CONCLUSIONS

This study focus on the identification of the degraded areas and factors involved causing the degradation found in the early twentieth century. Uneven regional pattern of forest land degradation provide the good reason to be investigated.

The capital neighboring areas and southern part of the country had been severely damaged. Koyang, Yeojoo, Ichon, Yeongi, Seonsan, Namwon Kuns are the most degraded zones.

In terms of ownership of forest land, private-owned forest dominated regions were heavily demolished.

The results obtained in this study suggest that population concentration, the accessibilities to the major waterways, and inappropriate forestry management policies were the main factors in accelerating the deforestation which led to uneven forest land degradation. The

regions which had the better accessibility to the major waterways seemed to be deforested and became less dense forest areas. In summer, when seasonal rainfall concentration increase the discharge, the accessible zones become flood-prone areas. The soil layers which become loose without vegetation can easily be washed away deteriorating the forest land.

We should not think of deforestation as merely a forestry problem. Changes are needed not only forest management policies, but also in social and economic policies, often not associated with deforestation, which cause the demolition of environment. I hope that the major factors suggested in this study can give the better directions and the references for future environment management policies.

Table 1. Ownership Pattern
(National Forest vs. Private-owned Forest)

| Region | National forest (%) | Private-owned forest | Total |
|---|---|---|---|
| Kyunggi | 224,115 (31.38) | 486,138 (68.07) | 714,112 |
| Chungbuk | 268,093 (50.33) | 260,295 (48.86) | 532,649 |
| Chungnam | 53,426 (11.39) | 407,387 (86.91) | 468,692 |
| Jeonbuk | 111,115 (21.06) | 405,497 (76.87) | 527,466 |
| Jeonnam | 252,476 (25.69) | 714,595 (72.72) | 982,628 |
| Kyungbuk | 461,657 (35.26) | 828,562 (63.28) | 1,309,274 |
| Kyungnam | 247,955 (27.94) | 624,306 (70.36) | 887,195 |
| Hwanghae | 460,933 (45.87) | 539,685 (53.70) | 1,004,839 |
| Pyungnam | 551,666 (55.20) | 439,667 (43.99) | 999.292 |
| Pyungbuk | 1,492,464 (62.30) | 882,430 (36.83) | 2,395,316 |
| Kangwon | 1,191,589 (62.37) | 701,449 (36.71) | 1,910,344 |
| Hamnam | 1,924,897 (76.38) | 586,201 (23.26) | 2,519,851 |
| Hambuk | 1,082,988 (67.68) | 504,631 (31.54) | 1,599,961 |
| Total | 8,3303,374 | 7,380,843 | 15,849,619 |

Sources: Forestry Statistical Yearbook, 1910.

Table 2. National Forest

| Region | Full Grown Tree Zone (%) | Infantile Tree Zone | Deforested Zone | Total |
|---|---|---|---|---|
| Kyunggi | 56,913 (25.41) | 28,542 | 138,610 (61.84) | 224,115 |
| Chungbuk | 57,847 (21.57) | 103,354 | 106,892 (39.87) | 268,093 |
| Chungnam | 8,924 (16.70) | 15,517 | 28,985 (54.25) | 53,426 |
| Jeonbuk | 75,618 (68.05) | 23,276 | 12,221 (10.99) | 111,115 |
| Jeonnam | 37,949 (15.03) | 75,073 | 139,454 (55.23) | 252,476 |
| Kyungbuk | 108,500 (23.50) | 150,991 | 202,166 (43.79) | 461,657 |
| Kyungnam | 69,224 (27.91) | 23,438 | 155,293 (62.62) | 247,955 |
| Hwanghae | 76,380 (16.57) | 305,319 | 79,234 (17.18) | 460,933 |
| Pyungnam | 206,106 (37.36) | 260,416 | 85,144 (15.43) | 551,666 |
| Pyungbuk | 810,713 (54.32) | 474,561 | 207,190 (13.88) | 1,492,464 |
| Kangwon | 587,885 (50.17) | 417,758 | 165,946 (14.16) | 1,171,589 |
| Hamnam | 1,405,593 (73.02) | 217,080 | 302,224 (15.70) | 1,924,897 |
| Hambuk | 791,699 (73.10) | 79,435 | 211,854 (19.56) | 1,082,988 |
| Total | 4,293,401 (51.70) | 2,174,760 | 1,835,213 (22.10) | 8,303,374 |

Sources: Forestry Stastical Yearbook, 1910.

Table 3. Private-owned Forest

| Region | Full Grown Tree Zone (%) | Infantile Tree Zone | Deforested Zone | Total |
|---|---|---|---|---|
| Kyunggi | 58,089 (11.94) | 267,410 | 160,639 (33.04) | 486,138 |
| Chungbuk | 23,999 ( 9.21) | 148,258 | 88,038 (33.82) | 260,295 |
| Chungnam | 80,159 (19.67) | 165,101 | 162,127 (39.79) | 407,387 |
| Jeonbuk | 187,774 (46.30) | 189,503 | 28,220 ( 6.95) | 405,497 |
| Jeonnam | 40,280 ( 5.63) | 592,749 | 81,566 (11.41) | 714,595 |
| Kyungbuk | 58,290 ( 7.03) | 604,166 | 166,106 (20.04) | 828,562 |
| Kyungnam | 42,773 ( 6.85) | 442,602 | 138,931 (22.25) | 624,306 |
| Hwanghae | 33,044 ( 6.12) | 428,653 | 77,988 (14.45) | 539,685 |
| Pyungnam | 26,331 ( 5.98) | 344,353 | 68,983 (15.68) | 439,667 |
| Pyungbuk | 57,566 ( 6.52) | 330,605 | 494,259 (56.01) | 882,430 |
| Kangwon | 56,320 ( 8.02) | 526,861 | 118,268 (16.80) | 701,449 |
| Hamnam | 48,361 ( 8.24) | 302,384 | 235,456 (40.16) | 586,201 |
| Hambuk | 19,577 ( 3.87) | 67,657 | 417,397 (12.08) | 504,631 |
| Total | 5,122,685 | 6,619,473 | 4,107,461 | 15,849,619 |

Sources: Forestry Statistical Yearbook, 1910.

## NOTES

1) Deforestation is defined as temporary or permanent clearance of forest for agriculture or other purposes. Degradation is the temporary or permanent deterioration in the density or structure of vegetation cover or its species composition. Deforestation, in which the density of vegetation cover is temporarily reduced to zero, is obviously the most extreme form of degradation. Degradation is also caused by over-hunting and pollution of air and water. Deforestation is to be used to refer to forest clearance it could be used in parallel with degradation.

2) Eyre, S.R., Vegetation and Soils, 2nd ed. Edward Arnold

3) Han, Dong Hwan, "The location and functions of Keumsan in Seoul of the early Choson dynasty," *Jour. of Geography*, Seoul National Univ. No.20, 1992, 17-32.

4) Hong, Keum Soo, *A study on the traditional salt-making in the Joolpo inlet area during 18th and 19th century*, Korea Univ. Master thesis, 1993.

5) Ibid.

6) Choe, Young Joon, ...Han River was a natural highway for transportation between the royal capital and the interior Korea in the Yi dynasty.... This route has become one of the busiest waterways.

7) Kang, Wee Pyung, 1974, "Relation between Barelands and Geological Factors" *Jour. Korean Forestry Asso.* 22, 63-65.

## REFERENCES

Burrough, P A, 1991, "Soil Information Systems," *Geographical Information System*, 153-169, Edited by David Maguire, M.F. Goodchild, and David Rhind, Longman Scientific Technical.

Chae,Youngjun, 1987, "Inland Navigation on the Nam Han River," *Geography*, Korean Geographical Society, 35, 49-82.

Choi, Kyung and Jeong Yong Choi, 1987, "A study on the plant succession and soil properties of the erosion controlled area," *Research Report Forest Institute of Korea*, 35, 69-78.

Choson Chongdokbu, 1910, 1911, 1912, *Choson*

*Yearly Statistical Report.*

Choson Chongdokbu, 1926, *On slash-and-burn field.*

Chongdokbu, 1929, 1931, 1932, 1934, 1935, 1936, 1937, 1938, *Erosion control project report.*

Choson Chongdokbu, 1940, *Forestry of Choson.*

Choson Chongdokbu, 1938, *Forestry Investigation Report of Choson.*

Cooke, R. U & J. C. Doornkamp, 1990, *Geomorphology in environmental management*, 2nd ed. Clarendon Press.

Department of Silviculture, Korea, 1988, *Rehabilitation history of degraded land.*

Ellis, Stephen, David Taylor, K. R. Masood, 1993, "Land degradation in northern Pakistan," *Geography*, 84-87

Eyre, S. R., 1975, *Vegetation and soils*, Arnold.

Grainger, Alan, 1993, *Controlling tropical deforestation*, Earthscan publications.

Han, Dongwhan, 1992, "The location and functions of Keumsan in Seoul of the early Choson dynasty," *Jour. of Geography*, Seoul national Univ. 20, 17-32.

Higgit, David, 1993, "Soil erosion and soil problems," *Progress in physical geography*, 17(4), 461-472.

Hong, Keumsoo, 1993, *A study on the traditional salt-making in the Joolpo inlet area during the 18th and 19th century,* M.A Thesis, Korea Univ. unpublished.

Kang, Wee Pyung, 1974, "Relation between barelands and geological factors," *Korean Jour. of Forestry,* 22, 63-65.

Kim, Jae Wan, 1992, *A study on the products and flows of salt in the later Choson dynasty(1392-1910), a case study of Han River Basin*, M.A.Thesis, Seoul National Univ. unpublished.

Lee, Chun Yong, 1986, "Changes of erosion control works project in mountainous area and their effects", *Nature Conservation*, 55, 24-30.

Son, Jeongmok, 1977, *Choson Sidae Dosi Sahoe Yeongu.*

Trudgill, Stephen, 1991, "Environmental Issues," *Progress in physical geography,* 15, 84-90.

Yang, Bo Kyung, 1994, "Sprawl of Seoul and the civic life," *Jour. of Seoul Studies,* Inst. of Seoul Studies, 48-77.

Zhou, H. Z., K. B. MacDonald, & A. Moore, 1991, "Some cautions on the use of geographic information system (GIS) technology to integrate soil site and area data," *Can. Jour. Soil Sci.*, 71, 389-394.

地理學論叢 第25號(1995. 2), 19-33.

# 삼림황폐 정도의 지역별 유형에 관한 연구

**황유정***

## 요약

한국의 삼림지 황폐는 오랫동안 문제가 되었으며, 나지에 의한 붕괴지 발생, 토사유출, 천정천의 출현에 이르는 환경문제가 끊임없이 발생되어 왔다.

본 연구는 20세기초부터 주요 하천 지역(한강, 금강, 영산강, 낙동강)을 중심으로 전면적인 수해에 직면하면서 삼림황폐가 극심한 지역을 우선적으로 사방사업이 실시되었으며, 그 조사 보고서를 토대로 각 군별로 당시의 삼림면적에 대한 훼손 정도를 전국적으로 비교 분석하였다. 삼림 벌채를 가져올 수 있는 여러 관련 가능한 요인과의 관계 속에서 지역별 삼림 훼손의 정도를 설명해 보고자 했다.

지금까지 삼림지 황폐에 대한 연구에서는 그 발생요인으로 남벌, 화전, 지질조건, 정치의 쇠퇴와 지방정부의 약화 등을 들고 있다. 이 연구에서는 삼림훼손의 지역적 특성을 파악함으로서 이에 관련된 당시 사회 경제적 배경을 기초로 또한 자연적 조건을 결부시켜 20세기초에 파괴된 삼림환경이 지역에 따라서는 어떠한 요인이 비교적 강하게 작용했을까를 살피고자 한다. 2차대전 후와 한국전쟁 후의 삼림황폐 상황은 20세기초와 크게 다르므로 본 연구에서는 다루지 않았다.

전국의 107개 군에서 그 피해 정도가 보고되었으며, 경기도는 가장 광범위한 피해가 나타났다. 특히 이천, 여주, 고양군에서 20% 이상의 면적이 훼손되었다. 그 다음으로 충청남도가 피해가 심하며 연기, 대전, 부여, 당진 등이 두드러진 피해지역이다. 전라도에서는 남원이 20%이상을 보였으며 경상북도의 선산, 김천, 경상남도의 거창, 합천이 심한 편이다.

지역적인 삼림훼손 정도의 불균형은 지역의 인구, 인구집중, 임야에 대한 정책, 다량의 목재를 소모하는 산업과의 비교, 화전인구와 면적의 비교, 임야의 소유관계, 지역간의 접근성의 차이, 주요 기반암의 분포와의 관련성 등과 관련시켜 보았으며 그 중에서 가장 극심한 황폐 정도를 나타내는 지역은 하나의 요인에 의한 것이라기보다는 둘 이상의 요인이 동시에 작용했을 것으로 간주된다. 지역의 접근성이 양호했던 곳들은 수로에 의해 인접지역 또는 나무를 다량으로 필요로 하는 지역에 수송하기에 용이했기 때문에 계속적으로 벌채되어 삼림지 훼손 정도가 더욱 더 크게 나타난 것으로 생각된다. 즉 수로에 인접했던 지역들은 우선적으로 벌채되어서 수목의 밀도가 좋지 않은데다, 하기의 집중호우시에 늘어나는 유량에 의해 나지에 있던 토양층이 더욱 쉽게 흘러 내려감으로서 황폐는 가속화되었을 것으로 생각된다.

**주요어** : 삼림지 황폐, 환경체계와 관리, 지역의 접근성

* 서울대학교 지리학과 강사