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Present Situation and Activation of Non–National Forests Management – Focused on Jeonbuk Province in Korea –

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The objectives of this study were to analyze the situation and problems of promoting the business of the non–national forest in Jeonbuk Province, and to activate the non–national forest management for the improvement of its income. To understand the current status of the non–national forest, data was surveyed and analyzed from 14 cities and counties in the Jeonbuk Province. In result, one of the reasons for stagnant non–national forest management is that there was no security of commercial succession in the non–national forest. The key to successful non–national management is a proper understanding of public interest of the worth of forests and the new strategy of non–national forests as a tertiary industry because economic management of the forest is difficult in the current situation. In addition, investment of non–timber products and launching the supports of non–national forests are required from the local government since the short–term forest products have a high possibility of success as strategic sources of high income. Jeonbuk Province has to adopt the business items suitable to the actual circumstances and the methods that can promote management of the non–national forest.

INTRODUCTION

The development–oriented policies under the economic system of capitalist markets have made market functions quite successful, but these policies have seriously destroyed our environment. Most of the latest issues such as global warming, carbon discharge rights, and sustainable forest management commonly focus on how to conserve our environment. Moreover, the importance of forestry and reason of existence are to effectively remove the environmental, social and cultural inverse functions in the area of economic development.

One of the most important issues in the forest area from the environmental problems we currently face is how to administer and manage the forest which is highly capable of carbon absorption. The reason being is that the forest is very important as a source of supplying a large quantity of oxygen that must exist to maintain the natural ecosystem such as climatic change, air purification and living organisms (Gene and Frederick, 1986).

Looking at the latest forest related trend, it tends to be focused on the sustainable forest management. This shows that the forest not only becomes an alternative that can solve environmental problems, but is pursued for diversified business operations rather than its management of direct use.

Accordingly, the forest has become a subject of interest internationally and its value appreciates.

In the case of Korea, about 64.1% of the entire land is forested, but the volume stays at a level that is half that of the advanced countries with 82.3 m^3/ha. The production amount of forest products was about 3.16 trillion KRW that is merely 0.4% of the GNP (Korea Forest Service, 2007). Although restoration of the devastated regions has been quite successful due to the mountain tree–planting policy for past 30 years, the forest area has gradually decreased since 1961 due to the land development–oriented growth.

Moreover, the private forest that takes up 68.9% (4.4 million ha) of the entire forest becomes an obstruction of forest management since they merely focus on their wealth accumulation, security of burial grounds and speculative motivation. More serious is that ownership is gradually shifting to the non–resident forest owners from the resident forest owners residing within the area (Kim, 1999). This proves that the private forest owners are not interested in forest management since forestry has limitations in the perspective of market functions. Consequently, it is difficult to expect that forestry management will take place without government support and policy involvement.

However, forest management does not have direct results and also, public forest management is left alone due to the lack of local government finances and will. This is because forestry activities are stagnant due to the worsened profitability of forest management from a rise of management costs such as long–term stagnation of forest trees and labor costs and the small–sized business operation as well as the characteristics of forestry such as the large initial investment, long–term investment and uncertainty (Jang *et al.*, 2000). The management of the non–national forest under these hard facts has fallen further behind and the studies on forest management have gradually decreased.

However, the forest holds its meaning of existence for public life as well as for the local and social perspectives of contributing to community development, such as providing a stable supply of wood, promoting land conservation, supporting public health and recreation, and

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protecting the security of water resources. These values for the existence of the forest are further emphasized due to increased environmental problems throughout the world and the need for balanced regional development.

Under these social and economic changes, it is essential to reestablish the value of forest, to increase income, and to understand the importance of environmental–friendly forest management. Therefore, this study was conducted to understand the management and current situation of the non–national forest that consists of about 80% of the entire forest area in Jeonbuk Province, to understand the components for the activation of forest management, and to provide information for the reasonable management of the non–national forest.

MATERIALS AND METHOD

Data collection

To understand the current status of the non–national forest in Jeonbuk Province, data was surveyed and analyzed from Korea Forest Service, Forest Administration Department of Jeonbuk Province, and Jeonbuk Branch of National Forestry Cooperatives Federation. The survey was carried out in 14 cities and counties in Jeonbuk Province from October 2003 to October 2004 for the 1st survey and the 2nd survey was conducted in 2007. For the forest resource investigation of the objective areas, we based it on the forest resource survey report published by Korea Forest Research Institute and have used the statistical information service of Jeonbuk for forestry related businesses.

To comprehend the actual conditions of non–national forest management, data was collected and analyzed in relation to the forest ownership of Jeonbuk Province, the forest area by the age class of the non–national forest, the current situation of public forest in Jeonbuk Province, the resident and non–resident owners of private forest, and the number of sincere forest managers.

To observe the income improvements through forestry, data collected along with the output of forest products, forestation and erosion control projects for the past 7 years (2000~2006) was used and analyzed. Also, to understand environmental–friendly forest management, we surveyed and analyzed the projects that directly or indirectly influenced the management of the non–national forest by the development year of the recreational forest and the number of yearly users within the non–national forest of Jeonbuk Province.

Analysis method

Dynamic analysis

To apprehend the income improvements of forestry, dynamic analysis was performed on the data for the past 7 years (2000~2006) through the time series data of forest products, forestation and erosion control projects. The dynamic analysis, as a statistical index based on time series, can be classified by the variation in single/multiple statistics, variation between statistics in distribution, and variation of the statistical value groups in a time series.

Estimate model according to number of users

The recreational forest operated by the non–national sector that fast grows as a public function and service industry was set to the development directions, and users were estimated to predict demand of the visitors to the recreational forest. This study has drawn the quantitative variations of users through the visitor data of recreational forests within the non–national forest of Jeonbuk Province while basing findings on the marginal model of Gompertz. This model, a technique of predicting the number of users in the future while based on the variation characteristics of time series in estimating the number of users, tries to estimate the number of users by setting the upper limit of user increase in the future.

The general form of the marginal model of Gompertz transformed to linear form is expressed as in the following.

$$P_t = a + b_t \quad (1)$$

Where, P refers to the number of users at the t year and a, b are the coefficients of the variable t.

RESULTS AND DISCUSSIONS

Forest situation of Jeonbuk Province

Forest situation of Jeonbuk Province by ownership

The forest situation by ownership of the total forest area of 449,152 ha in Jeonbuk Province, as shown in Table 1, is made up respectively by the national forest of 85,852 ha (19.2%), public forest of 28,842 ha (6.4%) and the private forest of 334,458 ha (74.4%). As compared to the ratio of country–wide average, 68.9% by private ownership, the ratio of private forest in Jeonbuk Province has appeared relatively high. Also as for the

Table 1. Forest land areas and growing stock by possession in Jeonbuk Province

Unit: ha, m^3

Classification	Forest land areas (ha)	(%)	Growing stock (m^3)	(%)	Growing stock (m^3/ ha)
Total	449,152	100	38,639,153	100	86.03
National forest	85,852	19.2	8,238,662	21.3	95.96
Pubic forest	28,842	6.4	2,483,532	6.4	86.11
Private forest	334,458	74.4	27,916,959	72.3	83.47

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

average volumes per hectare (m^3/ha), the volumes average of Jeonbuk Province with the national forest of 95.96 m^3, public forest of 86.11 m^3 and private forest of 83.47 m^3 is relatively high in comparison to the national average of 82.30 m^3.

Situation of the non–national forest

Looking at the area of the non–national forest by the age class, the age class I of the forest area is comprised of the public forest of 841 ha and private forest of 27,200 ha from the entire forest area of 28,041 ha. And the age class Ⅱ–Ⅴ of the forest area is comprised of the public forest of 27,312 ha and private forest of 296,466 ha from the entire forest area of 323,778 ha. Additionally, the age class Ⅵ includes the public forest of 155 ha and private forest of 2,141 ha from the entire forest area of 2,296 ha.

Particularly since most forest trees stay at the age level of 30~40 years, they are at the level needed for active tending operations considering the growth characteristics of forest trees. In particular since about 75% of the private forest is comprised of forest trees at the age class Ⅲ–Ⅳ, expansion of forest roads and facilities and increase of forest tending projects are highly required to keep in step with the age of sustainable forest management (Table 2).

The entire area of public forest from the non–national forest of Jeonbuk Province is 28,842 ha as shown in Table 3, respectively with 10,636 ha of provincial forest and 18,206 ha of county forest. The region that takes up the largest area is Jinan County, holding the public forest area of 6,506 ha respectively with the provincial forest of 3,665 ha and county forest of 2,841 ha. Contrarily, the region of taking up the smallest forest area is Jeonju City with the public forest area of 71 ha respectively with the provincial forest of 36ha and city forest of 35 ha.

Since the public forest is mostly distributed in the regions of Wanju (5,556 ha), Jinan (6,506 ha), Muju (3,922 ha), Jangsu (5,054 ha), Imsil (2,412 ha), Namwon (1,800 ha), and Sunchang (1,107 ha), it is required to associate management of the public forest distributed among these regions. This is because management of separated forests is burdensome, and apportioning regionally is the starting point of reasonable management by grouping and forming a large complex of forest areas. Therefore, the grouping project of the public forest is urgent to set a model for private forest management, which has been the existence of the public forest.

One of the greatest problems of private forest ownership in the non–national forest of Jeonbuk Province is that most of them are non–resident and their purpose of forest ownership comes from the desire for wealth accumulation, security of burial grounds and speculative motivation. The fact that a commercial purpose for forestry is not guaranteed becomes a factor that further

Table 2. Forest land areas of non–national forest by age class

Unit: ha

Classification			Total	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ	Ⅵ
Non–national Forest	Grand total		354,115	28,041	33,614	136,854	138,288	15,022	2,296
	Public forest	Total	28,308	841	1,350	12,078	11,552	2,332	155
		Provincial forest	10,384	135	357	4,487	4,312	1,093	–
		County forest	17,924	706	993	7,591	7,240	1,239	155
	Private forest		325,807	27,200	32,264	124,776	126,736	12,690	2,141

Note: Over age class Ⅶ is excluded.
Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

Table 3. Public forest land areas by city and county

Unit: ha

Classification	Sub–total	Provincial forest	%	County forest	%
Total	28,842	10,636	100	18,206	100
Jeonju	71	36	0.3	35	0.2
Kunsan	239	1	0.01	238	1.3
Iksan	179	3	0.03	176	1.0
Jeongeup	499	219	2.1	280	1.5
Namwon	1,800	98	1	1,702	9.4
Kimje	107	1	0.01	106	0.6
Wanju	5,556	4,230	39.8	1,326	7.3
Jinan	6,506	3,665	34.5	2,841	15.7
Muzu	3,922	375	3.5	3,547	19.4
Jangsu	5,054	1,001	9.4	4,053	22.2
Imsil	2,412	888	8.3	1,524	8.4
Sunchang	1,107	118	1.1	989	5.4
Gochang	157	–	–	157	0.9
Buan	1,233	1	0.01	1,232	6.8

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

alienates forest owners from forest management.

Looking at the current situation of resident and non–resident forest owners in Korea, the total number of forest owners as shown in Table 4 is 2,229,522 people and of this number, the Jeonbuk Province makes up about 8.9% with a total of 199,299 people. Nation–wide, the resident forest owners are 1,183,941 people (53%) and the non–resident forest owners are 1,045,581 (47%) people. The resident forest owners in Jeonbuk Province are 128,112 people (64%) and the non–resident forest owners are 71,187 people (36%).

The entire area of private forest in Jeonbuk Province totals 334,458 ha with a resident ownership area of 205,523 ha and non–resident ownership area of 128,945 ha. This shows that the resident forest owners hold possession of about 1.6 ha per person and the non–resident owners hold possession of about 1.8 ha per person. Considering that an area of 100 ha or more is needed to manage the forest reasonably, the forest ownership scale of Jeonbuk Province is very small.

On the other hand, the number of sincere forest managers at of the end of 2006 was 387 persons and the number gradually increases. Sincere forest managers can be largely divided into four types such as model, excellent, self–supporting and corporate managers. Looking at Table 5, the entire number of sincere forest managers throughout the nation was 387 persons; of this number, there were 34 model forest managers, 91 excellent forest managers, 249 self–supporting forest managers and 13 corporate forest managers.

Of this figure, the total number of sincere forest managers in the Jeonbuk area was 53 people; of these, there were 1 model forest manager, 8 excellent forest managers, 42 self–supporting forest managers and 2 corporate managers. The number of forestry successors was 1,805 people in the nation; of these, the number of forestry successors in Jeonbuk Province was 239 people. Looking at the statistical data above, Jeonbuk Province may have much difficulty in achieving reasonable forest management since the number of sincere forest managers and forestry successors who can take a lead in forest management is relatively small.

Amount of forest products

Looking at the amount of forest products in Jeonbuk Province for the recent 7 years (2000~2006), the amount of forest products is classified either by increasing or decreasing as shown in Table 6. While the products such as woods, fuels, nuts, mushrooms, medicinal plants and wild edible vegetables have increased, the products such as fiber materials, resins and bamboo shoots have decreased. Fiber materials and resins have almost disappeared as they have almost no value.

Figures 1–2 show the changes in the amount of forest products that have been produced in Jeonbuk Province for the recent 7 years (2000~2006). While the amount of wood production has gradually increased, most of the wood consumed each year is imported from foreign countries. Although this can be attributed to the lack of matured stands capable of wood production, the reason being may be that production increase is highly limited due to financial issues. Therefore, it is desirable to increase the production volume within the scope so that the amount of production can contribute to promoting the competitive power of the domestic wood processing industry and to the stability of wood supply. The production volume of mushrooms such as pine and pyogo mushrooms continuously increases (Figure 1).

The reason that the fuel production as shown in Figure 1 has increased in the recent years is because the price competitiveness of domestic wood has improved as

Table 4. Status of resident and absentee forest owners in Jeonbuk Province

Unit: persons, ha

Classi–fication	Forest owners						Areas					
	Total		Resident forest owner		Absentee forest owner		Total		Resident forest owners		Absentee forest owners	
	No. of owners	%	No. of owners	%	No. of owners	%	Area	%	Area	%	Area	%
Total	2,229,522	100	1,183,941	53	1,045,581	47	4,411,242	100	2,188,807	50	2,222,435	50
Jeonbuk Province	199,299	100	128,112	64	71,187	36	334,458	100	205,523	61	128,945	39

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

Table 5. Sincere forest managers and forestry successors in Jeonbuk Province

Unit: persons

Classification	Grand Total	Sincere forest manager					successor
		Total manager	Model manager	Excellent manager	Self–supporting manager	Corporate–manager	
Total	2,192	387	34	91	249	13	1,805
Jeonbuk	292	53	1	8	42	2	239

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

Table 6. Production of forest products in Jeonbuk Province

Year	Timber (m^3)	Fuel (M/T)	Nuts & fruits (kg)	Mushrooms (kg)	Fiber (kg)	Resin (kg)	Medicinal plants (kg)	Bamboo shoots (kg)	Wild vegetables (kg)
2000	127,259	6,578	6,973,776	1,435,785	3,500	23	140,481	34,791	1,120,598
2001	134,563	4,236	6,609,476	1,322,586	400	21	261,740	22,393	1,145,075
2002	159,514	2,735	6,862,193	1,699,595	–	–	134,308	23,907	1,065,208
2003	185,897	1,371	7,110,699	2,341,887	–	–	380,716	26,424	1,124,440
2004	235,323	4,651	8,325,810	1,713,282	–	–	342,325	20,079	1,032,238
2005	303,456	7,719	11,441,867	1,803,324	–	–	527,706	20,815	1,448,304
2006	228,897	36,475	14,374,040	1,917,495	–	–	449,241	14,543	1,596,586

Notes: 1) Nuts & fruits: Chestnut, Walnut, Pine nut, Jujube, Acorn, Gingko nut, others.
2) Mushroom: Pine mushroom, pyogo mushroom, Black Fungus, Oyster mushroom, others.
3) Medicinal plants: medical plant, Cornelian cherry fruit, others.
Source: Forestry administrative division in Jeonbuk Province.

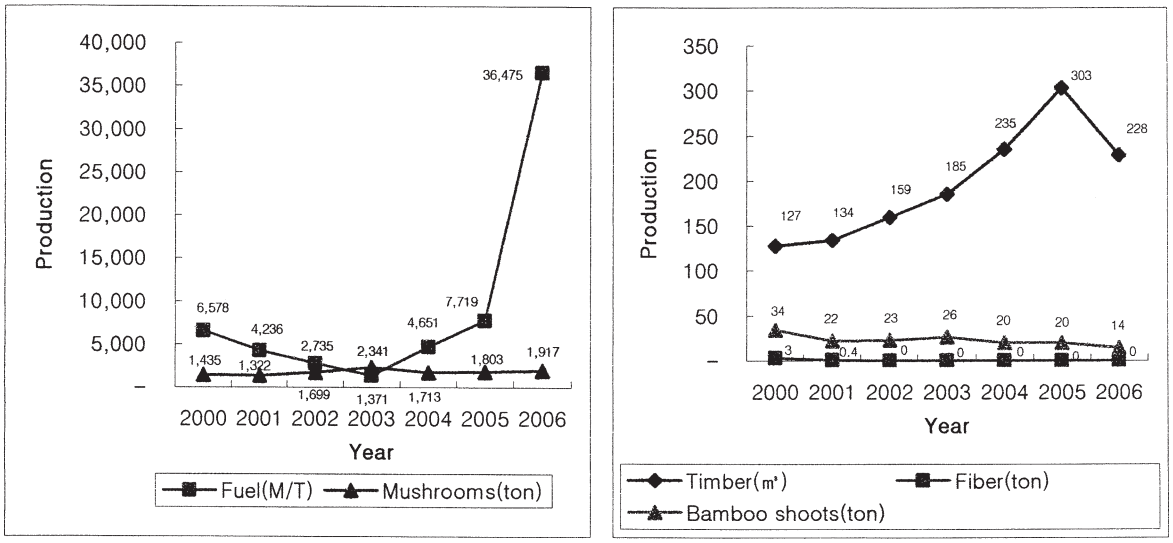

Fig. 1. Production of fuel, mushrooms, timber, fiber, and bamboo shoots.

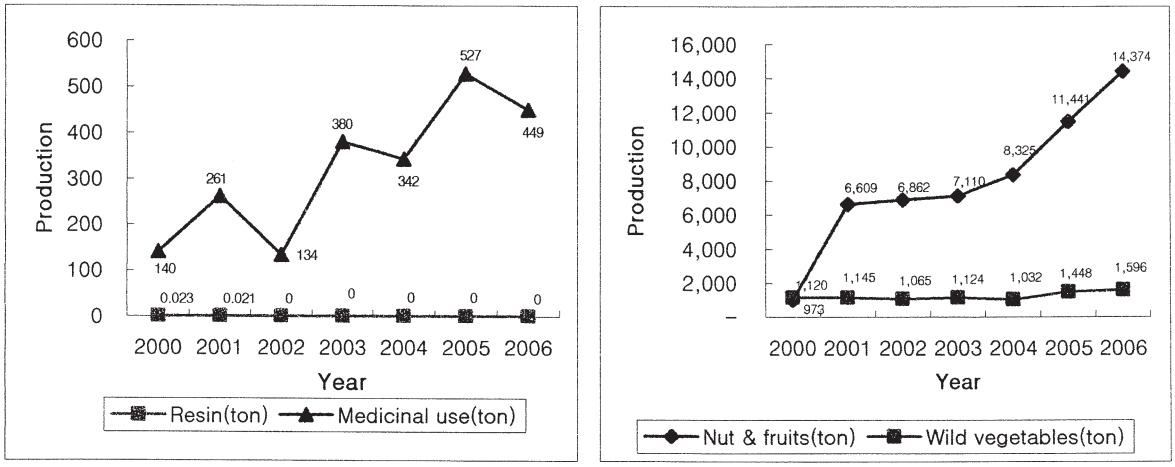

Fig. 2. Production of resin, medicinal plants, nuts and fruits, and wild vegetables.

compared to the price increase of imported wood from a sudden rise of marine transportation costs since the year 2003. The production of bamboo shoots has decreased from 34,791 kg in 2000 to 14,543 kg in 2006, and the production volume of fiber materials has not been noticeable since the year 2002.

As health awareness increases along with the population, preferences to medicinal plants have consistently increased. As if this tendency is reflected, the production volume of medicinal plants in the Jeonbuk Province

area has consistently increased as shown in the Figure 2. The main factors that increase and decrease may be attributable to a reduction in natural production and the increase of medicinal plants imported from China, the main country of import.

The production of nuts such as chestnut, walnut, pine nut and gingko nut has greatly increased from 6,973,776 kg in 2000 to 14,374,040 kg in 2006. The production of wild edible vegetables has apparently shown an increase from 1,120,598 kg in 2000 to 1,596,586 kg in 2006 (Figure 2). However, since the production base and competitive power are weak, most are overwhelmed by a large volume of cheap forest products from China. To overcome this situation, we need to build a management mind and system that can quickly respond to market changes and to create a network and efficient information exchange system for managers.

Since most of non–national forests in Jeonbuk Province are comprised of the trees with the age class Ⅲ–Ⅳ, forest managers may not secure a stable income in the short term. However, as the demand for forest products within the forest increases continuously from the improvements of living standards in recent days, support from Jeonbuk Province and local governments is highly in need.

The positive support of the local government for short–term forest products may encourage forest management. An intensive investment strategy is required for these short–term forest products to promote management of the non–national forests since the short–term forest products have a high probability of success as a strategic high income source.

Forestation in the non–national forest

The forestation area by ownership at the end of 2006 within the non–national forest of Jeonbuk Province totaled 3,164 ha, and the number of trees were 8,102,000 trees. Of these, the area of private forest makes up about 98% with 3,087 ha (8,017,000 trees). Jeonbuk Province, to prevent the rapid temperature increase of recent days, urban heat island due to the rapid growth of urban area and urban green–house effect, plants many trees in urban areas, on tree–lined streets and in forest areas. Also as the campaign of removing walls in the government and public offices and schools in the urban area becomes a trend focus has been given to planting trees appropriate to local characteristics.

As shown in Table 7 and Figure 3, the forestation of Jeonbuk Province can be characterized by the increase of coniferous trees and broad–leaved trees. In particular,

Table 7. Reforestation in Jeonbuk Province

Unit: ha, 1,000 seedings

Year	Conifers		Non–Conifers		Nut & fruit spp		Big seeding		Others	
	Area	No. of sdls	Area	No. of sdls	Area	No. of sdls	Area	No. of sdls	Area	No. of sdls
2000	692	1,932	558	2,063	266	157	194	304	–	–
2001	493	1,368	786	2,931	215	99	236	356	–	–
2002	199	609	614	3,448	237	133	274	294	–	–
2003	611	1,420	2,237	6,607	199	79	121	183	40	20
2004	513	1,251	1,961	4,952	141	62	208	374	83	29
2005	495	1,275	1,899	5,209	159	77	148	129	15	53
2006	778	1,993	2,386	6,109	161	132	405	380	53	55

Source: Forestry administrative division in Jeonbuk Province.

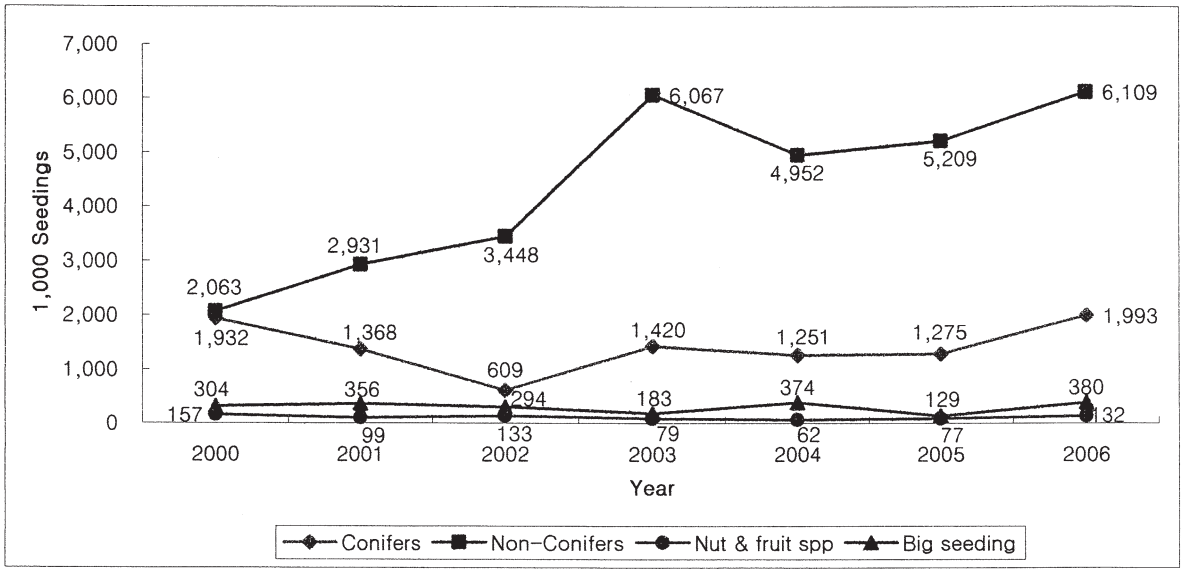

Fig. 3. Reforestation in Jeonbuk Province.

the forest of broad–leaved trees has increased from 2,063,000 trees in 2000 to 6,109,000 trees in 2006, increasing the forestation area of 558 ha to 2,386 ha. This result can be interpreted as the groves of broad–leaved trees are used for urban tree–lined streets and urban scenery and also, the ratio of broad–leaved trees tends to increase in order to stabilize the forest ecosystem. Most trees planted in the urban area are large, and this shows that the forestation area and number of trees have increased since the year 2000.

However, the forestation of the non–national forest holds several problems in spite of these efforts. Firstly, they lack in a sense of sovereignty for the business as a forest owner; in other words, they do not have the will to take care of the forest by themselves. Secondly, the proper forestry can not be accomplished due to the economic scale and difficulty of owners and lack of management technology. Thirdly, the financial support for sincere forest owners by the local government is not sufficient although there is an aid in the perspective of forestation business. To solve for these problems imminently, it is judged that a lot of change should be made in the policy perspective of forestry promotion.

To solve these problems, selection of the tree species shall be made according to the main body of forestation (private forest, public forest). Profitability shall have priority in selecting the tree species of forestation from the perspective of forest owners since they take the leading role in raising the self–sufficiency of domestic timber. Even the forestation policy corresponding to the management policy of long–term timber supply and forest resources can be avoided if profitability is not guaranteed in the perspective of forest owners. Accordingly, selection of the tree species for forestation shall be determined according to the party of forestation. The policy on the selection of forestation tree species that has uniformly recommended tree species regardless of the main body of forestation should be reestablished to induce voluntary participation of forest owners.

It is essential to increase forestry income innovatively

Table 8. Accomplishment of erosion control in Jeonbuk Province

Unit: ha, 1,000 seedings, 1,000 won, km

Year	Total			Coastal erosion control			Torrent erosion control			Erosion control dam sweeping	
	Area	No. of sdls	Business amount	Area	No. of sdls	Business amount	Business amount	Extension	Places	Business amount
2000	5.0	12.0	2,674,095	5.0	12.0	718,422	859,180	7.5	13	1,096,493
2001	5.0	6.0	3,846,543	5.0	6.0	784,227	1,456,658	12.0	15	1,605,658
2002	8.5	2.9	3,681,703	8.5	2.9	550,791	1,269,325	13.0	14	1,861,587
2003	8.0	13.0	6,278,013	8.0	13.0	1,198,232	2,252,857	16.0	19	2,826,924
2004	8.6	12.3	8,405,850	8.6	12.3	1,071,206	3,135,829	18.0	20	4,642,612
2005	9.0	20.9	7,057,882	9.0	20.9	1,192,031	1,972,419	11.0	18	3,893,432
2006	11.0	21.6	7,005,884	11.0	21.6	741,900	1,695,550	9.0	20	4,568,434

Source: Forestry administrative division in Jeonbuk Province.

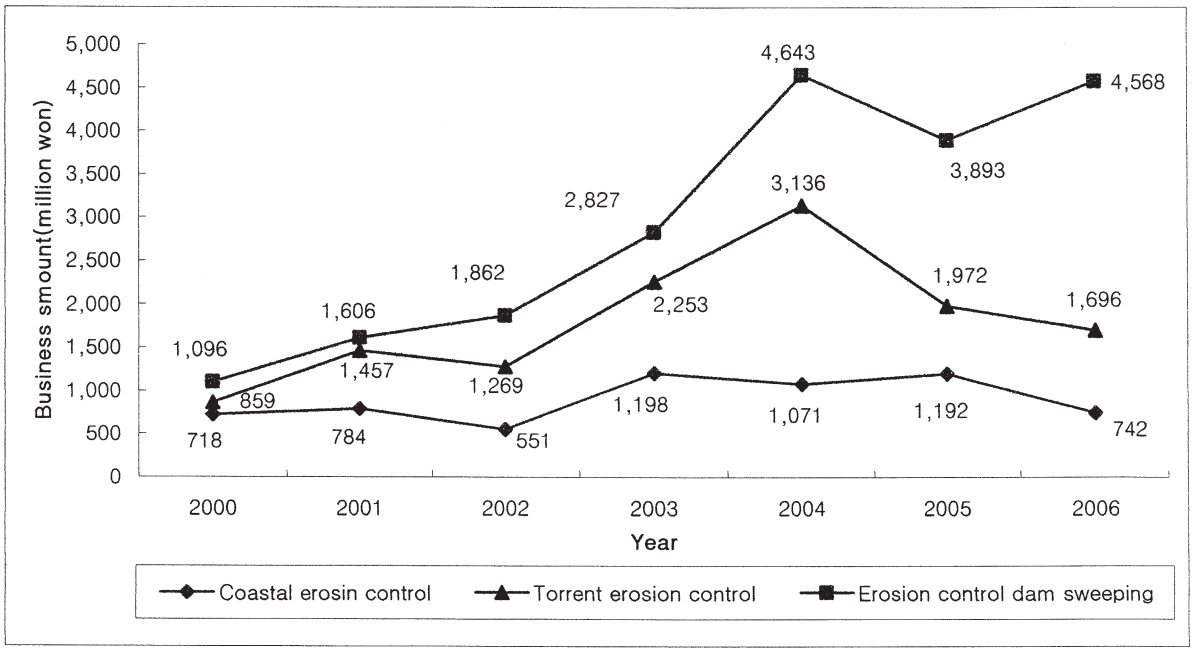

Fig. 4. Amount of erosion control projects in Jeonbuk Province.

by developing tree species suitable to the forestation environment. The timber self–sufficiency level of 30% that the Forestry Service has suggested for the forestation vision in the 21st century (Korea Forest Service, 2000) may not be achieved only by foresting the national forest. It is obvious that the promotion of the non–national forest corresponding to 80.8% of the entire forest area may determine the future of forestry in Jeonbuk Province.

Erosion Control project within the non–national Forest

Since the forest in Korea has the young stand, the forest cover is limited. Also, consistent management of forests is necessary due to a lot of torrential streams from geographic features, which sweep soils and sands from hilly countries and raise the number of floods from the rapid flows of rivers when there is a lot of rainfall (Woo, 1997). In the current situation of Jeonbuk Province where the ratio of artificial forest is high, a consistent and appropriate measure of erosion control is urgently needed.

The erosion control project of Jeonbuk Province as shown in Table 8 and Figure 4 has increased from 718,442 thousand KRW in 2000 to 741,900 thousand KRW in 2006 for the construction cost of forest and sand dune fixation, from 859,180 thousand KRW in 2000 to 1,695,550 thousand KRW in 2006 for the construction cost of torrent wild stream erosion control, and from 1,096,493 thousand KRW in 2000 to 4,568,434 thousand KRW in 2006 for the construction cost of debris barrier. The total construction cost of the erosion control project in Jeonbuk Province has increased from 2,674,095 thousand KRW in 2000 to 7,005,884 thousand KRW in 2006 and the number of debris barriers has increased from 13 places in 2000 to 20 places in 2006. This shows the result that the functions of the forest have enhanced not only the economic functions but also public interests.

The effects that have appeared from the result of erosion control within these non–national forests may aid in preventing disasters, developing a source of water supply and preserving the water quality. In particular, Jeonbuk Province may have a large keeping effect of water due to the debris barrier since the lengths of valleys are short and water flows only during the rainy season. Also, erosion control is essential in that the forest damage made by humans gradually increases along with the population and industrial development in providing for the preservation of the living environment. If the ground is damaged, restoration can be quite difficult since the earth and soil can be easily eroded from a small quantity of rainfall until the ground can be stabilized.

Accordingly, the facilities installed in the non–national forests such as multi–purpose debris barrier, erosion control of community environment and cleanup facility of torrent for water quality have multi–purpose effects such as disaster prevention, water supply, water quality control and residential environment improvement. Hence, they can play the roles of maximizing the public functions of forests by providing various goods and services to residents.

Management of the non–national forest as a tertiary industry

Operation of recreational forest in Jeonbuk Province

Economic management of the forest is difficult in the current situation of Jeonbuk Province. So, the importance of forest management has to be emphasized more as a tertiary industry. As for the operation of recreational forest, the non–national forest has more potential and can provide a good model of creating economic benefits. Forestry in Korea since the 1990s has tried to shift into one of the tertiary industries that is a recreation business in an attempt to get out of the primary industries or secondary industries of material processing, and the Forestry Service has started to promote the recreational forest as an important business since the year 1988. Therefore, the recreational forests in the Jeonbuk areas were mostly established after the year 1990.

Jeonbuk Province has developed and operated 9 recreational forests where the natural view is excellent and the places are near urban areas. There are 6 places such as Gosan, Daea, Waryong, Banghwa–Dong, Sesim and Heungbugol in Namwon that recreational forests are owned and operated by local governments in Jeonbuk Province. On the other hand, there are only two places (Seongsusan and Namwon) owned and operated by individuals and 1 place (Banditbul) owned and operated by a local county. The recreational forest with the largest area is the Gosan recreational forest with 673 ha and the smallest is Namwon recreational forest with 32 ha. In particular, the recreational forests of Gosan and Seongsusan are representative in the nation for their respective sizes of 673 ha and 425 ha.

Although the recreational forests owned and operated by local governments have achieved the economic benefits as well as promoted public interests since they are close to urban areas and are naturally beautiful, the economic benefits are quite limited as compared to the initial investments. Even under these difficult situations, the financial situation of the Gosan recreational forest close to the urban area is improving, gradually making profits as it has an annual average of 50,000 visitors since its opening and the recreational forests in Seongsu–Dong, Waryong and Namwon have an annual average of 10,000 visitors.

As shown in Table 9, the total number of recreational forest visitors in Jeonbuk Province has increased from 102,000 people in 2000 to 168,079 people in 2006. The reason that the increasing trend of recreational forest visitors dropped both in 2002 and 2004 is because the recreational forests as well as various convenient facilities were damaged from sweepings and landslides due to the typhoons Rusa and Maemi. Therefore, it is necessary to take the appropriate measures suitable to the demand by predicting the number of recreational forest visitors rather than simply using the statistics of recreational forest visitors and to use this data for the reasonable operation of recreational forests.

Estimation of recreational forest users

The detailed plan such as facility size and investment time can not be established without quantitative

Table 9. Number of visitors to recreational forests in Jeonbuk Province

Unit: persons

Classification	2000	2001	2002	2003	2004	2005	2006
Daea	–	–	–	–	–	–	–
Seong–susan	21,662	24,145	10,631	19,964	20,111	19,319	21,500
Waryong	20,189	23,298	21,754	22,977	22,165	13,816	15,202
Namwon	–	–	1,585	9,645	20,379	30,364	28,584
Sesim	4,968	4,865	2,058	2,992	3,705	1,454	2,050
Namwon–Hungbugol	–	–	2,509	78,050	3,480	4,078	4,162
Gosan	55,181	76,023	71,599	–	73,970	83,665	92,605
Banghwadong	–	–	–	21,059	4,047	3,476	3,976
Total	102,000	128,331	110,136	157,366	147,857	156,172	168,079

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry.*

estimation and dynamic analysis. Accordingly, before drafting a more detailed and practical plan, the estimation of visitors in the corresponding area shall be preceded (Won, 1996). This study has drawn the quantitative variations of users through the visitor data of recreational forests within the non–national forest of Jeonbuk Province while basing findings on the marginal model of Gompertz. This model, as a technique of predicting the number of users in the future while based on the variation characteristics of time series in estimating the number of users, tries to estimate the number of users by setting the upper limit of user increase in the future. The number of recreational forest users in the Jeonbuk areas has greatly increased from 57,704 people in 1995 to 168,079 people in 2006 (Table 10). To establish a reasonable management policy of recreational forests by using these statistics, it is necessary to estimate the demand for the recreational forest in the future.

A change in the trend of the number of recreational forest users can be calculated from the linear regression analysis model as in the following.

$$P_t = a + b_t \quad (1)$$

Table 10. Visitors trend to recreational forests in Jeonbuk Province

Unit: persons

Year	Population	Year	Population
1995	57,704	2001	128,331
1996	130,366	2002	110,136
1997	109,265	2003	157,336
1998	73,076	2004	147,857
1999	116,490	2005	156,172
2000	102,000	2006	168,079

Source: Korea Forest Service. 2007 *Statistical yearbook of forestry*.

Table 11. Estimation of visitors to recreation forests in the future

Unit: persons

Year	Population	Year	Population
2009	215,582	2014	271,992
2010	226,864	2015	283,274
2011	238,146	2016	294,556
2012	249,428	2017	305,838
2013	260,710	2018	317,120

Where, P refers to the number of users at the t year and a, b are the coefficients of the variable t. Calculating the parameter values of linear regression equation, a=1224 and b=11281 could be obtained.

Accordingly, the following expression can be obtained.

$$P_t = 1{,}224 + 11{,}282_t \quad (2)$$

Estimating the number of users in the future from the year 2009 by using the function (2) yielded the result as shown in Table 11.

When the number of recreational forest visitors drastically changes due to an external factor, it may not be practical to estimate the number of visitors in the long term of 20 years or more. Therefore, the number of recreational forest users for 10 years from 2009 to 2018 was estimated. According to the estimated result of recreational forest users within the non–national forests of Jeonbuk Province using the marginal model of Gompertz, the number of users will continuously increase from 215,582 people in 2009 to 317,120 people in 10 years.

Assuming that the number of recreational forest visitors keeps increasing, development of a reasonable way of managing recreational forests will be needed while considering use of recreational resources for future generations. In other words, the recreational forests within the non–national forest should be consistently supported and managed so that people can resolve stress and spend time in the nature in accordance with its original purpose. Also, the public functions of non–national forests should be extended by developing an efficient policy with various programs that could be provided to users in connection with the forest life experience, history, culture and education.

CONCLUSION

To promote use of the non–national forest, a more practical management strategy is essential in solving the financial difficulty of forest owners and their small ownership structure. To overcome these problems, Jeonbuk Province has to adopt the business items suitable to the actual circumstances. The methods that can promote management of non–national forests are followed as below.

Firstly, we need to maximize use of the forest from the perspective of benefit to the public. Recently, as the forest becomes an important issue in resolving environmental problems, interest and awareness for the public functions of the forest have greatly increased. The public functions of the forest can be achieved when we manage it actively rather than letting it merely exist. In other words, the goal of non–national forest management is to improve the healthy state of the forest and to consistently secure the public functions of the forest through various erosion control projects.

Secondly, an intensive investment shall be made in developing short–term forest products. The proportion of short–term forest products of the total production amount of forestry in 2006 has reached to about 30%. Therefore, the income improvement of short–term forest products may help promote management of the forest that has been left alone from disinterest in management will.

Thirdly, to activate forestation business, grouped timber production forest should be secured and selection of tree species should vary according to the subject of forestation. Forestry within the non–national forest has not been appropriately made due to lack of owners' will, pettiness, lack of management technology, and insufficient local government support. To solve these problems, 1~2 strategic tree species should be selected and the collectivized and sized timber production forest should be secured. Also, tree species high in profitability and short in rotation time of harvesting timber should be recommended.

Finally, the non–national forests should be developed as tertiary industries. Since the purpose of forest management is of public benefit, it will be effective to put more weight on the tertiary industries under the situation that most of the forests in Jeonbuk Province are at the age class Ⅲ–Ⅳ. Currently, the recreational forests within the non–national forests of Jeonbuk Province have not been reasonably operated since they have neither introduced a concept of service marketing nor predicted demand in the future. Accordingly, they have to be consistently managed while considering the systematic management programs and promotion measures based on the demand suggested and predicted in this study and at the same time, should be developed as places of education that can nurture the ecological sensitivity and imagination of people.

REFERENCES

Gene, W and J. D. Frederick. 1986 *Urban forestry*. John Wiley and Sons. New York

Jang, C. S., Y. S. Hwang and Y. L. Kim. 2000 *The SOC investment and direction of policy improvement in forest area*. Korea Rural Economic Institute

Kim, N. K. 1999 *A plan of reformation of Forestry Cooperative Federation. A note of discussion about improvement direction of Forestry Cooperative Federation*

Korea Forest Service. 2000 *The 21st Century Forest Vision*

Korea Forest Service. 2007 *Statistical yearbook of forestry*

Won, J. M. 1996 *Technique of policy analysis*. Parkyoungsa, Korea

Woo, B. M. 1997 *Erosion control engineering*. Hyangmoonsa, Korea