Study on Gathering and Production Structure of Pine Nuts in Korea : Centering on Gapyeong-gun, Gyeonggi-do and Hongcheon-gun, Gangwon-do

Kang, Hag Mo
Faculty of Forest Science, Chonbuk National University

Lee, Sang Hyun
Faculty of Forest Science, Chonbuk National University

Kim, Hyun
Faculty of Forest Science, Chonbuk National University

Sato, Noriko
Faculty of Forest Science, Chonbuk National University

https://doi.org/10.5109/18858

出版情報：九州大学大学院農学研究院紀要. 55 (2), pp.403-410, 2010-10-29. Faculty of Agriculture, Kyushu University
バージョン：
権利関係：

J. Fac. Agr., Kyushu Univ., **55** (2), 403–410 (2010)

Study on Gathering and Production Structure of Pine Nuts in Korea – Centering on Gapyeong–gun, Gyeonggi–do and Hongcheon–gun, Gangwon–do –

Hag Mo KANG[1], Sang Hyun LEE[1]*, Hyun KIM[1] and Noriko SATO

Laboratory of Forest Policy, Division of Forest Environment and Management Sciences,
Department of Forest and Forest Products Sciences, Faculty of Agriculture,
Kyushu University, Fukuoka 812–8581, Japan
(*Received June 30, 2010 and accepted July 9, 2010*)

In the results of survey against households engaging in gathering and producing pine nuts in Gapyeong–gun, Gyeonggido and Hongcheon–gun, Gangwon–do, the representative pine nuts producing region in Korea, it was found that average household managing land were relatively smaller as 1.5 ha and 0.9 ha in Gapyeong–gun and Hongcheon–gun. Among 20 households having forest in Gapyeong–gun, only 3 households conducted thinning practice during the last 5 years and any positive forest management such as forest practice for increase of pine nuts production and silviculture and crown shape control facilitating gathering of pine nuts was not shown. However, although the ration of income from pine nuts against the whole gross income took relatively large ratio as 46% and 45% in Gapyeong–gun and Hongcheon–gun, respectively, only 4 household of Gapyeong–gun and 2 households of Hongcheon–gun had a plan for expansion. Therefore, it was concluded that in this depressed situation of Korean forest management, review of various measures such as support of cold storage for public use to prevent price drop in flood shipment and the end of gathering and prepare price rise in the alternate year, support of hulling machines for public use to save the cost for hulling, installation and expansion of transport way for pine nuts, and purchase for price stabilization of pine nuts would be required to make the pine nuts gathering and producing activity expanded as a stable income source of rural and mountain households.

INTRODUCTION

Pine nuts are seeds of *Pinus Koraiensis Sieb. et Zucc*, which have been used for foods and drugs widely and of which demand is being expanded as an eco–friendly agricultural product with increase of people income. Due to the continuous reforestation of *Pinus Koraiensis Sieb. et Zucc*, gathering amount and production of pine nuts were increased dramatically to 1.52 million kg and 13.2 billion won as of 2006 compared with those of past and imported amount and price of pine nuts were also increased largely to 397 ton and 2.41 million dollars in 2007. However, the characteristics of *Pinus Koraiensis Sieb. et Zucc*, alternate year bearing, make the yield of seeds irregular. In addition, the gathering and production of pine nuts involve many difficulties such as increase of labor cost for production, reduction of yield from global warming, aging of its gathering labor, risks accompanied with its gathering, and price competition with imported products from increase of import, but pine nuts give a large help to increase of rural and mountain household income. Nevertheless, there is few or no positive and concrete domestic study on gathering and production structure of pine nuts such as effect of pine nuts on rural household economy other than the study on crown shape control of *Pings koraiensis S. et Z*. directly related to yield of pine nuts. Therefore, the purpose of this study is to grasp problems and seek future direction for development in Korean forestry management conditions that is depressed because of long term feature and low profitability by investigating production and sale structure against pine nuts gathering and producing households in Gapyeong–gun, Gyeonggi–do and Hongcheon–gun, Gangwon–do, where pine nuts take large ratio in household income source.

MATERIALS AND METHODS

This survey was performed against householders of 29 households in Gapyeong–gun, Gyeonggi–do and 9 households in Hongcheon–gun, Gangwon–do as the representative production regions of pine–nuts in Korea. The survey was conducted through personal interview for 2 months from the beginning of April in 2008 to the beginning of June in 2008 and the contents of survey included the reproduction structure such as labor composition, constitution of gross household income, managing land status, forest management status, scale, place, income, selling method of pine nuts gathering, and difficulties in gathering and production of pine nuts. The survey data was analyzed by regions, ages, managing land scales, and managing forest scales.

RESULTS AND DISCUSSIONS

Nationwide status of pine nuts gathering and production

Areas of Pinus Koraiensis Sieb. et Zucc forest by regions

Total area of needle forest and broad–leaf forest in

[1] Faculty of Forest Science, Chonbuk National University, Chonju, 561–756, Korea
* Corresponding author (E–mail: leesh@chonbuk.ac.kr)

Korea, 4,355 thousand ha, consists of 2,695 thousand ha (62%) of needle forest and 1,660 thousand ha (38%) of broad leaf forest and *Pinus Koraiensis Sieb. et Zucc* forest takes 5% of total forest area and 9% of needle forest. By regions, Gangwon–do has 77 thousand ha, followed by Gyeonggi–do with 66 thousand ha and Gyeongsangbuk–do with 28 thousand ha and for needle forest, Gyeonggi–do has the highest ratio of *Pinus Koraiensis Sieb. et Zucc* forest as 34%, followed by Gangwon–do with 16% and Chungcheongbuk–do with 11% (Korea Forest Service, 2007)

Production status of pine nuts with a cone by regions

When production quantity and amount of pine–nuts with a cone by years were investigated, the production quantity increased from 0.68 million kg in 2002 to 1.52 million kg in 2006 and the average annual production quantity for 5 years from 2002 to 2006 was 2.04 million kg. By regions, its production quantity in Gangwon–do has increased every year and occupied 64% of total production as 0.97 million kg as of 2006. The average annual production for last 5 years was 1.06 million kg. Its production amount in Gyeonggi–do has also increased every year and occupied 27% of total production amount as 0.42 million kg as of 2006. The average annual production for last 5 years was 0.83 million kg.0.83. Besides, its production amount increased largely from 6.5 billion won in 2002 and to 13.2 billion won in 2006 and the average annual production amount was 14.8 billion won. By regions, Its production amount in Gangwon–do has increased every year and occupied 56% of total production as 7.4 billion won as of 2006. The average annual production for last 5 years was 6.9 billion won. Gyeonggi–do took 26% of nationwide production amount in 2006 and the average annual production amount was 5.9 billion won.

Nationwide status of pine nuts gathering and production in target lands subjected to investigation

Gapyeong–gun, Gyeonggi–do

In case of Gapyeong–gun, Gyeonggi–do (hereinafter Gapyeong–gun), the total production quantity of pine nuts with a cone for 6 years from 2002 to 2007 was 3.71 million kg and the average annual production quantity was 0.62 million kg. The production ratio by possession states for total production quantity was 93% of private forest and 7% of provincial forest. The average annual gathering quantity of private forest was the highest as 570 thousand kg, followed by provincial forest with 40 thousand kg and national forest with 2 thousand kg.

Hongcheon–gun, Gangwon–do

In case of Hongcheon–gun, Gangwon–do (hereinafter Hongcheon–gun), the total production quantity of pine nuts with a cone for 6 years from 2002 to 2007 was 5.25 million kg and the average annual production quantity was 0.88 million kg. The production ratios by possession states for total production quantity were 99% of private forest and 1% of provincial forest. The average annual production quantity of private forest and public forest was 870 thousand kg and that of national forest was 10 thousand kg (Gapyeong–gun, 2008; Hongcheon–gun, 2008; Chuncheon National Forest Office, 2008; Hongcheon National Forest Office, 2008).

Case study on pine nuts gathering and producing farms

Reproduction structure of cultivation farm

State of Labor Constitution

In Gapyeong–gun, it was found that average age of householder and average number of household was 54 years old and 2.4 persons respectively. In Hongcheon–gun, it was found that they were 44 years old and 2.9 persons. It was identified that the average number of household was more as much as 0.5 people and the average age of householder was lower as much as 10 years compared with Gapyeong–gun.

When investigating by age classes, it was found that in Gapyeong–gun, 40's and 50's took the largest ratio as 36% and 27% respectively and in Hongcheon–gun, 50's and 40's took the largest ratios as 31% and 23% respectively. Besides when investigating employment state by regions, it was found that 14 households among 29 households in Gapyeong–gun engaged in temporary forestry work and 6 households among 9 households in Hongcheon–gun engaged in temporary forestry work. It was suggested that the temporary forestry work engaging ratio of Hongcheon–gun was higher than that of Gapyeong–gun (Table 1).

State of Managing Land and Forest

It was found that among 38 households subjected to this survey, 1 household of Gapyeong–gun and 2 households of Hongcheon–gun had no managing land and total area of managing land possessed by households with managing land was 44.5 ha. It was found that average house-

Table 1. Labor constitution (Unit: person)

Classification	Total (person)	household average	20's	30's	40's	50's	60's	over 70's
Gapyeong–gun (29 households)	70 (100)	2.4	1 (1)	1 (1)	25 (36)	19 (27)	12 (17)	12 (17)
Hongcheon–gun (9 households)	26 (100)	2.9	1 (4)	3 (12)	6 (23)	8 (31)	2 (8)	6 (23)

Note: People under 20 years old were excluded the total of household members

Table 2. Managing cultivated forest and forest possession

Classification			Farm land (ha)				Forest (ha)			
			Total	household average	possession	lease	Total	household average	possession	lease
Gapyeong–gun	By ages	Total(29)	44.5(100)	average	19.9(45)	24.6(55)	152.2(100)	5.2	95.9(63)	56.3(37)
		40's (11)	12.9	1.5	6.7	6.2	49.3	4.5	35.0	14.3
		50's (11)	19.7	1.2	7.1	12.6	40.9	3.7	5.9	35.0
		60's (5)	9.6	1.8	3.8	5.8	53.0	10.6	43.0	10.0
		70's (2)	2.3	1.9	2.3	–	12.0	6.0	12.0	–
	By lands	No management(1)	–	–	–	–	3.0	–	–	3.0
		Under 1 ha(10)	4.6	0.5	3.4	1.2	21.9	2.2	13.6	8.3
		1~2 ha(9)	13.8	1.5	5.3	8.5	78.3	8.7	53.3	25.0
		2~3 ha(5)	11.3	2.3	5.8	5.5	27.0	5.4	27.0	–
		Over 3 ha(4)	14.8	3.7	5.4	9.4	25.0	6.3	2.0	23.0
	By forests	No management(9)	9.7	–	1.9	7.8	–	–	–	–
		Under 5 ha(10)	14.5	1.5	7.4	7.1	20.9	2.1	14.9	6.0
		5~10 ha(3)	4.3	1.4	3.0	1.3	23.3	7.8	15.0	8.3
		10~15 ha(4)	11.2	2.8	5.4	5.8	41.0	10.3	21.0	20.0
		Over 15 ha(3)	4.8	1.6	2.2	2.6	70.0	23.3	45.0	25.0
Hongcheon–gun	By ages	Total(9)	8.3(100)	0.9	5.6(67)	2.7(33)	–	–	–	–
		30's (1)	1.0	1.0	–	1.0	–	–	–	–
		40's(3)	1.6	0.5	0.6	1.0	–	–	–	–
		50's(5)	5.7	1.1	5.0	0.7	–	–	–	–
	By lands	No management(2)	–	–	–	–	–	–	–	–
		Under 1 ha (3)	1.8	0.6	1.1	0.7	–	–	–	–
		1~2 ha(3)	3.8	1.3	1.8	2.0	–	–	–	–
		2~3 ha(1)	2.7	2.7	2.7	–	–	–	–	–

Note: 1. The value in ( ) of classification is number of household.
2. The value in ( ) is the component ratio.

hold managing land was 1.5 ha and 0.9 ha in Gapyeong–gun and Hongcheon–gun respectively and its scale of Gapyeong–gun was near 2 time large than that of Hongcheon–gun. For forest, it was found that in Gapyeong–gun, 13 households among 29 households held forest by possession or lease but in Hongcheon–gun, there was no household holding forest. The reason of above result was considered because almost all forest around the target regions consisted of national forest.

Status of forest tree constitution and forest practice

In the forest tree constitution of 20 households in Gapyeong–gun holding forest, it was found that *Pinus Koraiensis Sieb. et Zucc* took the largest ratio as 58% and other part was natural forest where needle leaf trees and broad leaf trees were mixed. It was also found that 3 households in 20 households conducted thinning forest commencement during the last five years. Although 1 household left the thinned wood in its forest and 2 households applied them as firewood for heating, any positive forest management such as forest commencement for increase of pine nuts production and silviculture and crown shape control facilitating gathering of pine nuts (Table 3) was not shown.

Table 3. Forest wood constitution and forest

Classification			Forest wood constitution (ha)					Commencement (ha)	
			Total	White pine	Larch	Codonopsis lanceolata	Others	Total	Thinning
Gapyeong–gun	By forests	Total(29)	155.2(100)	90.0(58)	1.0	1.0	63.2	6.0	6.0
		No management(9)	–	–	–	–	–	–	–
		Under 5 ha(10)	20.9	18.0	–	–	2.9	6.0	6.0
		5~10 ha(3)	23.3	18.0	–	–	5.3	–	–
		10~15 ha(4)	41.0	32.0	–	–	9.0	–	–
		Over 15 ha(3)	70.0	22.0	1.0	1.0	46	–	–

Note: 1. Commencement state is data within recent 5 years.
2. The value in ( ) is the component ratio.
3. The value in ( ) in the above classification is the number of households.

Movement state of land possession

For purchasing and selling state of land such as paddy field and upland and forest, it was found that in Gapyeong–gun, the land took the most ratio of purchasing as 86% through inheritance and 6 households sold 2.1 ha of land in 2000's for economic reasons. In Hongcheon–gun all the purchasing of land were made by inheritance and there was no selling. For the forest, 1 household sold 3.1 ha for business promotion in 2000's. Like these, the reason why both purchasing and selling of land were low in both regions was considered that because forest occupied large ratio, the amount of land was little and people recognized the land as the base of self–consumption and household economy stabilization.

Household gross income state

The average household gross incomes of Gapyeong–gun and Hongcheon–gun in 2007 were 42 million won and 18 million won respectively and Hongcheon–gun was only 43% of Gapyeong–gun. For your reference, the nationwide average farm income in 2007 was 32 million won and average household income of civil workers was 44 million won (Ministry of Food, Agriculture, Forestry, and Fisheries, 2008). For the whole gross income constitution of 29 households in Gapyeong gun, it was found that pine nuts took the large part as 46%, followed by livestock farming with 18%, agriculture with 15%, and temporary forestry works with 8%. It was found that by ages, 40's occupies the largest part, by managing land scales, no management class took the largest part, and by forest management scales, the class with 5~10 ha had the most average household gross income. It was suggested that by factors, lower age had the higher average household gross income, but other difference between classes by factors was not distinct. It was suggested that the income from pine nuts took the larger part in their income when the age was lower and the managing land scale was smaller, but there was no large difference by forest management scales. In case of Hongcheon–gun, it was also found that pine nuts took the large part as 45%, followed by agriculture with 20%, temporary forestry work with 18% and constant forestry work with 11%. It was shown that by ages, 50's took the largest ratio and by managing land scales, 2.0~3.0 ha had the most average household gross income. Although there was no distinctive trend in difference between classes by factors, it was suggested that in case of pine–nuts income, lower aged class took higher ratio in the average household gross income. Besides, the temporary forestry works indicated mainly engaging in agriculture or engineering project in both Gapyeong–gun and Hongcheon–gun, the forestry work of Gapyeong gun was logging, and the constant forestry work indicated engaging in Yeonglimdan of national forest (Table 5).

Household gross income state

For future center of household economy, it was found that among 29 households in Gapyeong–gun, the number

Table 4. Purchasing and selling of land and forest

Classification			Purchasing										Selling				
			Total		Inheritance		Before 1980		1990's		2000's		Total		1990's	2000's	
			Land	Forest	Land	Forest	Land	Forest	Land	Forest	Land	Forest	Land	Forest	Land	Land	Forest
Gapyeong–gun	By ages	Total(29)	19.9	95.9	17.1	90.6	1.8	5.0	0.2	–	0.8	0.3	2.4	10.6	0.3	2.1	10.6
		40's (11)	6.7	35.0	5.9	35.0	–	–	–	–	0.8	–	0.3	–	–	0.3	–
		50's (11)	6.4	5.9	5.1	5.6	1.1	–	0.2	–	–	0.3	1.7	8.0	0.3	1.4	8.0
		60's (5)	4.5	43.0	3.8	38.0	0.7	5.0	–	–	–	–	0.4	2.6	–	0.4	2.6
		70's (2)	2.3	12.0	2.3	12.0	–	–	–	–	–	–	–	–	–	–	–
	By lands	No management(1)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Under 1 ha(10)	3.4	13.6	3.1	12.6	–	1.0	–	–	0.3	–	–	–	–	–	–
		1~2 ha(9)	4.6	53.3	3.3	49.0	–	4.0	0.2	–		0.3	0.8	10.6	0.3	0.5	10.6
		2~3 ha(5)	5.8	27.0	5.3	27.0	–	–	–	–	0.5	–	0.8	–	–	0.8	–
		Over 3 ha(4)	6.1	2.0	5.4	2.0	–	–	–	–	–	–	0.8	–	–	0.8	–
	By forests	No management(9)	1.9	–	0.8	–	1.1	–	–	–	–	–	0.8	8.0	–	0.8	8.0
		Under 5 ha(10)	7.4	14.9	7.2	9.6	–	5.0	0.2	–		0.3	1.0	2.6	0.3	0.7	2.6
		5~10 ha(3)	3.0	15.0	2.7	15.0	–	–	–	–	0.3	–	–	–	–	–	–
		5~10 ha(4)	6.1	21.0	4.9	21.0	0.7	–	–	–	0.5	–	0.6	–	–	0.6	–
		Over 15 ha(3)	1.5	45.0	1.5	45.0	–	–	–	–	–	–	–	–	–	–	–
Hongcheon–gun	By ages	Total(9)	2.9	–	2.9	–	–	–	–	–	–	–	3.1	–	–	3.1	–
		30's (1)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		40's (3)	0.6	–	0.6	–	–	–	–	–	–	–	–	–	–	–	–
		50's (5)	2.3	–	2.3	–	–	–	–	–	–	–	3.1	–	–	3.1	–
	By lands	No management(2)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Under 1 ha(3)	1.1	–	1.1	–	–	–	–	–	–	–	3.1	–	–	3.1	–
		5~10 ha(3)	1.8	–	1.8	–	–	–	–	–	–	–	–	–	–	–	–
		5~10 ha(1)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 5. Household gross incomes

Classification			Total	household average	Pine nuts	Livestock	Agriculture	Temporary forestry work	Constant forestry work	Forestry work	Mushroom	Others
Gapyeong–gun	By ages	Total(29)	120,805(100)	4,166	55,700(46)	21,450(18)	17,715(15)	9,160(8)	2,800(2)	2,080(2)	1,500(1)	10,400(9)
		40's (11)	63,260(100)	5,751	32,150(51)	10,000(16)	8,670(14)	6,540(10)	2,000	1,000		2,900
		50's (11)	42,260(100)	3,842	18,720(44)	6,350(15)	4,940(12)	1,870	800	1,080	1,500	7,000
		60's (5)	13,210(100)	2,642	4,670(35)	4,300(33)	3,490(26)	750	–	–	–	–
		70's (2)	2,075(100)	1,038	160(8)	800(39)	615(30)	–	–	–	–	500
	By lands	No management(1)	6,390(100)	6,390	3,510(55)	–	–	1,680(48)	1,200(19)	–	–	–
		Under 1 ha(10)	43,895(100)	4,390	27,810(63)	8,200(19)	635	3,550(8)	800	–	–	2,900
		1~2 ha(9)	36,130(100)	4,014	15,950(44)	4,450(12)	2,930(8)	2,660(7)	800	840	1,500	7,000
		2~3 ha(5)	24,750(100)	4,950	5,230(21)	8,800(36)	9,770(40)	450	–	–	–	500
		Over 3 ha(4)	9,640(100)	2,410	3,200(33)	–	4,380(45)	820	–	1,240	–	–
	By forests	No management(9)	40,410(100)	4,490	22,280(55)	3,000(7)	9,010(22)	2,380	1,600	240	1,000	900
		Under 5 ha(10)	41,945(100)	4,195	20,280(48)	4,650(11)	2,725	4,090(10)	1,200	1,000	500	7,500
		5~10 ha(3)	18,880(100)	6,267	6,700(36)	8,000(42)	1,730(9)	450	–	–	–	2,000
		5~10 ha(4)	13,570(100)	3,393	3,930(29)	5,800(43)	3,480(26)	120	–	240	–	–
		Over 15 ha(3)	6,000(100)	2,000	2,510(42)	–	770	2,120(35)	–	600	–	–
Hongcheon–gun	By ages	Total(9)	16,060(100)	1,784	7,150(45)	–	3,250(20)	2,910(18)	1,750(11)	–	–	1,000(6)
		30's (1)	850(100)	850	850(100)	–	–	–	–	–	–	–
		40's (3)	4,540(100)	1,513	2,900(64)	–	400	1,240(27)	–	–	–	–
		50's (5)	10,670(100)	2,134	3,400(32)	–	2,850(27)	1,670(16)	1,750(16)	–	–	1,000
	By lands	No management(2)	3,400(100)	1,700	1,400(41)	–	700	1,300(38)	–	–	–	–
		Under 1 ha(3)	5,890(100)	1,963	2,300(39)	–	450	390	1,750(30)	–	–	1,000
		5~10 ha(3)	4,070(100)	1,357	2,750(68)	–	100	1,220(30)	–	–	–	–
		5~10 ha(1)	2,700(100)	2,700	700(26)	–	2,000(74)	–	–	–	–	–

Note: 1. The value in ( ) in the above classification is the number of households.
2. The value in ( ) is the component ratio.

of households who answered agriculture was 11, followed by livestock with 7 and pine nuts with 6 household. However, in 40's and 50's by ages, they answered that livestock, pine nuts and forestry work would be the center of household economy compared with agriculture. For managing land scales, it was found that the households included 18 of expansion and 9 of current state maintenance. Among the 18 households who answered the hope for expansion, 14 households answered that its purpose was agriculture expansion, 3 households wished for the property increase and 1 household desired the expansion of livestock. For forest managing scale, it was found that the answerers comprised 14 of expansion, 11 of current state maintenance, and 2 of reduction. Among the 14 households who answered to have a plan for expansion, 6 households wished for the property increase, 3 household wished for the pine nuts production, and 5 households answered that its purposes were property increase and formation of special use trees, fruit trees, special crops, and family ground. It was also found that most of them were in 40's and 50's.

Among 9 households of Hongcheon–gun, 3 households answered agriculture, 2 households answered forestry work for the center of household economy. All of the 3 households who answered pine nuts were in 30's and 40's. For managing land scale, it was found that the answ5erers comprised 5 of expansion and 4 of current state maintenance. However, all the 5 households that answered to have a plan for expansion answered that the reason was agriculture expansion. For forest managing scale, it was found that the answerers comprised 4 of expansion and 5 of current state maintenance. However, 3 households in 4 households who answered to have a plan for expansion answered that its purpose was formation of family ground and 1 household answered that the purpose was property increase.

General State of Pine Nuts Gathering and Production
Income structure of pine nuts

For the pine nuts income and plan for pine nuts gathering and production of 18 households in Gapyeong–gun holding white pine forest, it was found that total area of white pine forest was 90 ha and area for gathering of pine nuts was 61 ha, corresponding to 68% of total white pine forest area. Among the above 18 households, it was found that the number of households who had pine nuts income from their own white pine forest was 11, the average income from pine nuts per ha was 1.28 million won and average household income was 7.12 million won. Besides, among the above 11 households who had income from pine nuts, 2 households in 70's and 1 house hold in 40's obtained their income by assigning their pine nuts gathering right to others. The 7 households without income from pine nuts answered that they discontinued

their gathering and production activities of pine nuts because of labor weakening, difficulty in securing labor for gathering, and low profitability.

Gathering, production, and selling structure of pine nuts

In case of Gapyeong–gun, it was found that their experience of pine nuts gathering and production was 6~42 years and average 30 years and the motives of pine nuts gathering and production were its short main gathering time from late August to mid October when agricultural works were not concentrated, undiversified income source, and relatively better income that other

Table 6. Agroforestry management planning Unit: household

Classification			Total	Center of household economy						Scale of managing land			Forest management scale			
				Agriculture	Livestock	Pine nuts	forestry work	Mushroom	Others	Expansion	Current state maintenance	No answer	Expansion	Current state maintenance	Reduction	No answer
Gapyeong–gun	By ages	Total(29)	29	11	7	6	2	1	2	18	9	2	14	11	2	2
		40's (11)	11	3	3	3	2	–	–	8	2	1	6	3	1	1
		50's (11)	11	4	3	2	–	1	1	8	3	–	7	4	–	–
		60's (5)	5	3	1	1	–	–	–	2	2	1	1	2	1	1
		70's (2)	2	1	–	–	–	–	1	–	2	–	–	2	–	–
	By lands	No management(1)	1	–	–	–	–	–	–	1	–	–	1	–	–	–
		Under 1 ha(10)	10	1	3	4	2	–	1	6	4	1	5	5	–	1
		1~2 ha(9)	9	3	2	2	–	1	1	5	3	1	4	3	1	1
		2~3 ha(5)	5	4	1	–	–	–	–	4	1	–	3	2	–	–
		Over 3 ha(4)	4	3	1	–	–	–	–	3	1	–	2	1	1	–
	By forests	No management(9)	9	3	1	2	2	1		7	1	1	6	2	–	1
		Under 5 ha(10)	10	2	3	3	–	–	2	4	6	–	4	6	–	–
		5~10 ha(3)	3	1	2	–	–	–	–	3	–	–	2	1	–	–
		10~15 ha(4)	4	3	1	–	–	–	–	3	1	–	1	2	1	–
		Over 15 ha(3)	3	2	–	1	–	–	–	1	1	1	1	–	1	1
Hongcheon–gun	By ages	Total(9)	9	2	–	3	2	–	2	5	4	–	4	5	–	–
		30's (1)	1	–	–	1	–	–	–	–	1	–	1	–	–	–
		40's (3)	3	–	–	2	1	–	–	2	1	–	1	2	–	–
		50's (5)	5	2	–	–	1	–	2	3	2	–	2	3	–	–
	By lands	No management(2)	2	–	–	–	1	–	1	1	1	–	1	1	–	–
		Under 1 ha(3)	3	–	–	1	1	–	1	2	1	–	1	2	–	–
		1~2 ha(3)	3	1	–	2	–	–	–	2	1	–	2	1	–	–
		2~3 ha(1)	1	1	–	–	–	–	–	–	1	–	–	1	–	–

Note: The value in ( ) in the above classification is the number of households

Table 7. Pine nuts income state

Classification			White pine forest (ha)	Gathering area (ha)	Pine nuts income (10 thousand KRW)	Pine nuts income/ Gathering area (10 thousand KRW)	Household average (10 thousand KRW)
Gapyeong–gun	By ages	Total(18)	90	61	7,830(11)	128	712
		40's (7)	41	29	4,640(4)	160	1,160
		50's (4)	13	3	300(1)	100	300
		60's (5)	24	17	2,730(4)	161	683
		70's (2)	12	12	160(2)	13	80
	By lands	No management(1)	3	–	–	–	–
		Under 1ha(5)	16	10	2,530(4)	253	633
		1~2ha(5)	28	23	1,870(3)	81	623
		2~3ha(3)	27	27	3,130(3)	116	1,043
		Over 3ha(4)	16	1	300(1)	300	300
	By forests	No management(9)	–	–	–	–	–
		Under 5 ha(8)	18	12	2,830(5)	236	566
		5~10ha(3)	18	12	1,900(2)	158	950
		10~15ha(4)	32	20	2,730(2)	137	1,365
		Over 15 ha(3)	22	17	370(2)	22	185

Note: The value in ( ) in the above classification is the number of households.

crops. Besides, for the places gathering pine nuts or obtaining income, it was found that lease of other's private forest was 10 households, lease of national forest + lease of other's private forest was 4, own private forest was 4, rent of own private forest was 3, own private forest + lease of other's forest + lease of national forest was 2, own private forest + lease of national forest was 2, own private forest + lease of other's forest was 2, lease of national forest was 1, and employed for gathering was 1. It was suggested that most gatherers and producers promotes increase of household income through lease of other's private forest and national forest in addition to their own private forest. Pine nuts sales of 26 excluding 3 households who rented their own private forest and 1 household through employment were made through route such as assembler (11 households), processor (7), Forest Association (3), Forest Association + assembler (3), and processor and assembler (1). For the reason that sales to assemblers and processors took larger ratio, it seemed because the assembler paid the price of pine nuts regardless of gathering amount or fixed the price to be relatively higher. However, they answered that in some cases, they might decide to sell pine nuts to the assembler in spite of proposal of low price, considering discomforts such as delivery. It was also found that the sale to processors was made from the advance payment and proposal of little bit higher price in some cases and in other cases they sold their pine nuts to the processor because of long term intimacy as neighbor. In case of Forest Association, some produces avoided the sale because of post payment for partial amount and the producers who sold their whole production to Forest Association answered that it was because they considered direct and indirect relationship with Forest Association. As shown in the above results, it was identified that the sales way of pine nuts gathering and production had complex and various routes from several reasons.

In case of Hongcheon–gun, it was found that their experience of pine nuts gathering and production were 1–35 years and average 22 years and the motives of pine nuts gathering and production were its short main gathering time from late August to mid October when agricultural works were not concentrated and increase of family income for overcoming restriction in relatively smaller managing land scale. However, it seemed that most of the forest around the villages consisted of national forest, so its gathering and production activities have been made naturally. All the households gathered pine nuts or obtained income in national forest and 8 households of them sold the pine nuts to a processor located in their own village and 1 household sold them to Forest Association + the processor.

Difficulties and future plan in gathering and production of pine nuts

In case of Gapyeong–gun, they answered that difficulties in gathering and production of pine nuts included labor weakening from aging, fall risk in gathering, and lack of carrying way and they wished support of machinery able to eliminate hulls from pine cones and Cold Storage for public use. In addition, they hoped the purchase of pine nuts by local governments for price stabilization of pine nuts. For future plans for gathering and production activities of pine nuts, it was found that 19 household had plans to keep current state, 4 households planned expansion, and 2 households planned reduction. In case of Hongcheon–gun, they answered that difficulties in gathering and production of pine nuts included labor weakening from aging, fall risk in gathering, and lack of carrying way. For future plans for gathering and production activities of pine nuts, it was found that only 2 household in their 40's had plans for expansion and 7 households planned to keep current state.

CONCLUSION

1. Hongcheon–gun had more average family member as much as 0.5 person, lower average range as low as 10 years old, and higher ratio of engaging in temporary forestry work compared with Gapyeong–gun.
2. The average household managing land was 1.5 ha and 0.9 ha in Gapyeong–gun and Hongcheon–gun respectively and its scale of Gapyeong–gun was near 2 times larger compared with that of Hongcheon–gun. For forest, it was found that in Gapyeong–gun, 13 households among 29 households held forest by possession or lease but in Hongcheon–gun, there was no household holding forest.
3. In the forest tree constitution of 20 households in Gapyeong–gun holding forest, it was found that *Pinus Koraiensis Sieb. et Zucc* took the largest ratio as 58% and 3 households in 20 households conducted thinning forest practice during the last five years. However any positive forest management such as forest practice for increase of pine nuts production, silviculture and crown shape control facilitating gathering of pine nuts (Table 3) was not shown.
4. In Gapyeong–gun, the land took the most ratio of purchasing as 86% through inheritance and 6 households sold 2.1 ha of land in 2000's for economic reason. In Hongcheon–gun, all the purchasing of land were made by inheritance and there was no selling.
5. The average household gross incomes of Gapyeong–gun and Hongcheon–gun in 2007 were 42 million won and 18 million won respectively and Hongcheon–gun was only 43% of Gapyeong–gun. However, the ratios of pine nuts against the total gross income of Gapyeong–gun and Hongcheon–gun were relatively large as 46% and 45% respectively. The income from pine nuts of Gapyeong–gun took higher ratio in average household gross income when the age was lower; the managing land scale was smaller; and that of Hongcheon–gun took higher ratio when the age was lower.
6. The income and average household income per ha from pine nuts of 11 households with income among 18 households of Gapyeong–gun having white pine forest were 1.28 million won and 7.12 million won respectively. However, 7 households without income

from pine nuts answered that they discontinued the gathering and production activity of pine nuts because of labor weakening, difficulty in securing labor for gathering, and low profitability.

7. In case of Gapyeong–gun, the production places were various including one's own private forest, other's private forest, and national forest and their sales routes were various also including processors, assemblers, and Forest Association. In Hongcheon–gun, the production places and sales route were relatively simple as national forest and processors.
8. For future plan associated with the gathering and production activities of pine nuts, only 4 households in Gapyeong–gun and 2 households in Hongcheon–gun had plans for expansion.

The households engaging in gathering and producing pine nuts in Gapyeong–gun and Hongcheon–gun where the income from pine nuts occupies large ratio in household economy continues the gathering and producing activities for overcoming the restriction of their small production base and promoting stabilization of life in spite of the risks accompanied with gathering of pine nuts. However, because of characteristics of white pine, alternate year bearing, the gathering and production of pine nuts are accomplished once per 2–3 years periodically and the pine nuts producing households maintains their household economy by expanding their participation in temporary forestry works such as logging or engineering works in the period when the income from pine nuts is few. Especially, the opinion that the yield of pine nuts decreases from reduction of bearing, increase of fruit drop, and increase of disease and vermin under the effect of recent global warming is proposed. Therefore, it seems that following measures should be sought on the gathering and production activities of pine nuts for further increase of family income.

1. It was considered that because selling pine nuts in unshelled state after hulling might save the cost for hulling, hulling machines for public use were needed.
2. IT seemed that support of cold storage for public use would be needed in order to prevent price drop in flood shipment and the end of gathering and prepare price rise in the alternate year.
3. It was considered that purchasing in a certain price by local governments for preventing price fixing by assemblers or processors would contribute to the price stabilization of pine nuts. However, it seemed that because purchase of the whole quantity had some limitations, the measure to expand the purchase gradually against pine nuts produced in forests where forest practices such as thinning were performed according to the plan should be considered.
4. It seemed that because considerable households discontinued their pine nut gathering and producing activities from great amount of labor required for transport of pine nuts and a lot of households had intentions to restart their gathering and producing activities when forest road and way for transport would be established, construction and expansion of delivery route was needed.
5. Most of the households gathering and producing pine nuts in Gapyeong–gun and Hongcheon–gun answered that profit division presented by national forest or provincial forest imposed a burden. Therefore, it seemed that a measure to reduce the share of national forest and provincial forest in the current sharing ratio for increasing the income of gathering and producing households, considering long term mutual protective relationship with the local residents such as forest fire prevention and forest protection is required.
6. Although most of pine nuts gathering and producing households had an insurance for gathering period or 1 year for preparing various injuries that might be accompanied with gathering, there were a lot of opinions that their security was weak, so was relatively ineffective. In addition, some households gathering and producing pine nuts through lease of other's forest might not have any insurance. Therefore, it seemed that a measure for this would be required.
7. Finally, the activities gathering and producing pine nuts stand as an income source of rural and mountain village households in this depressed situation of forest management in Korea. However, when several technologies, including a technology to induce and expand crown shape control of *Pinus Koraiensis Sieb. et Zucc* and increase of yield and a technology to increase the yield are developed, it seems to be an opportunity to improve the future production of good woods and its function for public interest by promoting activation of forest management as well as increasing their income.

REFERENCES

Chuncheon National Forest Office. 2008 *Internal data*
Korea Forest Service. 2007 *Statistical Yearbook of Forestry*
Gapyeong–gun. 2008 *Annual state of pine nuts gathering*
Hongcheon–gun. 2008 *The yield of Hongcheon pine nuts*
Hongcheon National Forest Office. 2008 *Internal data*
Jae Seon Yi *et al.* 2002 Crown Shape Control of *Pinus Koraiensis S.et z. Jour. Korean For. Soc.* **91**(3): 247–253
Ministry of Food, Agriculture, Forestry, and Fisheries 2008. 2008 *Major statistics of food, agriculture, forestry, and fisheries*