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Changes and development plans in the mountain villages of South Korea: Comparison of the first and second national surveys

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Abstract: Owing to the geographic disadvantages of mountain villages, the social, cultural, and economic conditions of mountain villagers are inferior to those of urban dwellers in South Korea. Thus, in 1995, the The government of South Korea launched a mountain village development support program to promote agriculture and forestry, balance national land development, and preserve cultural heritage. The program was effectively implemented, improving the income, population size, and living conditions of villagers in addition to setting up a system for stable project implementation. However, concerns were raised about long-term development planning, the creation and marketing of specialty brands, facility management/operation, and follow-up support. The government conducted surveys of mountain villagers in 2003 and 2014, obtaining basic data to address these issues. This study evaluates the outcomes of these two surveys, suggesting areas requiring focused action, concentrating on village development projects, forest resource distribution and use, demographic trends, the economy, exchange with urban areas, green tourism, and master planning. We find that despite growth in the forest labor force, forest ownership is diminishing in terms of the number and scale of holdings. Consequently, it is necessary to commercialize forest resources, establish favorable settlement conditions, and expand government support for village-run projects. In addition, systematic forest management for older tree age classes would benefit the public and provide assets for future mountain village development. Our results are expected to provide baseline information for the establishment and efficient implementation of mountain village development policy.

Keywords: Forest resources management; Mountain village changes; Mountain village economy; Support for mountain villages; Urban–rural exchange

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Introduction

Mountain villages, in contrast to urban cities, have fewer employment opportunities and medical facilities, limited transportation systems, and fewer amenities such as shopping malls and entertainment facilities. The disadvantageous geographical location of mountain villages means that the social, cultural, and economic conditions of mountain villagers are inferior to those of urban dwellers. Low agricultural productivity and the small size of the labor force limit the economies of mountain villages. Moreover, the mountain village labor force is also affected by aging inhabitants, rising wages, and low forestry productivity, all of which adversely affect the generation of income. For example, mountain villages in Japan have experienced accelerated aging and depopulation because of the outflow of the young population through the decline in agriculture and forestry. Consequently, in 2010, the elderly population (65 years or older) was 11 percentage points higher in mountain villages (34%) than in the rest of the country (23%).

However, mountain villages are important for producing agricultural and forestry commodities, maintaining a balanced land development nationally, and preserving the cultural and traditional heritage of forest regions. Governments have thus aimed to promote mountain village development in order to balance land development nationally, bridge the economic gap between urban and rural areas, enhance forest functions that contribute to public interest, and maintain forest culture and traditions (Nishino 2010, Korea Forest Service 2014a, Ministry of Agriculture, Forest, and Fisheries 2015). For example, mountain village development policies have been implemented in Japan and China, countries located in northeast Asia like Korea that have similar forest ownership structures.

Since the late 1990s, owing to increasing regional and urban-rural disparities, the Chinese central government has focused on reducing economic polarization and endorsing programs that alleviate inequality (Chen and Zheng 2008; Li and Wei 2010; Li et al. 2013). Major policies adopted by the central government have included the Western Development Program (WDP) and the Grain for Green Project (GGP) as well as the promulgation of agricultural support and a "building a new countryside" strategy, promoting abundant research on their effects (see Wang and Wei 2004; Lin and Ren 2009; Tian and Huang 2010 on the WDP; Uchida et al. 2005; Trac et al. 2007; Xu et al. 2007; Cao et al. 2009; Grosjean and Kontoleon 2009 on the GGP; Kennedy 2007; Kwieciński and van Tongeren 2007; Gui 2008; Yu and Jensen 2010 on agricultural support policies; Jiang 2007 on the "building a new countryside" strategy). Among these, the case study by Li et al. (2013) focused on Shuanghe village, in one of China's mountainous regions, and on new directions for rural policies to be based on a move (1) from a sectoral to a location-based policy, (2) from top-down incentives to the development of a bottom-up project, (3) to fully recognize the diversity of rural space; and (4) to integrate various sectoral policies and change the rural policies of departments at the regional and local levels.

Similarly, the Japanese government anticipates using the tangible and intangible regional resources that prevail in mountain villages such as abundant forests and water resources, scenic beauty, unique food culture and tradition, and closeness to nature to enable urbanites to access a rich, natural, and traditional culture, relax away from the worries of daily urban life, and experience nature in close proximity. In accordance with this, the Japanese government is revitalizing mountain villages by creating new businesses to promote, preserve, manage, and expand local forestry and lumber industries (Ministry of Agriculture, Forestry, and Fisheries 2015). Japanese scholars have also suggested mountain village policies associated with a sustainable forest industry and conducted comprehensive research to understand the motives of those relocating to mountain villages. However, research on mountain villages is time-consuming, as it requires the analysis of household management at the village and the individual scales (Nishino 2010; Sakai 2004; Fukushima 2015; Sato 2005).

The Korean government launched its national mountain village development support program in 1995. By the end of 2012, 312 villages had profited from this program, experiencing improvements in income, population size, and living conditions as well as having a system set up for stable project implementation. However, the program also has

many issues that require attention. These issues include the insufficient surveying of natural resources, a lack of long-term development planning, and a government-centered, top-down approach to project management. In addition, there is insufficient development and marketing of forest specialty brands, inadequate facility management and operation, and insufficient follow-up support. Some actions proposed to address these issues include expanding mountain village subsidies, increasing the motivation and active involvement of local residents, tailoring projects to specific mountain villages, and enhancing the use of non-timber forest products to boost income (Kang 2007).

In the 1990s, studies of Korean mountain villages focused on classifying forest villages by type and identifying factors contributing to their development (Lee 1986; Chang and Choi 1989; Kim and Shon 1995; Kang et al. 1998b). Other studies have also focused on ways of fostering social forestry development conducive to mountain area settlement (Kim and Shon 1994; Kang and Lee 1996; Choi et al. 1998; Kang et al. 1998a; Kang et al. 1999). Studies conducted in the 2000s emphasized the Korean government's mountain village development support program (Shon and Chang 2000, 2002; Kwak and Kim 2002; Yoo et al. 2005; Jeon and Chung 2007; Chang 2008). Within this framework, fact-finding surveys were conducted in mountain villages (Yoo et al. 2003; Kim et al. 2004; An et al. 2005; Seo et al. 2009), the perceptions and participation of residents involved in mountain village tourism were investigated (Eom 2004; Moon 2004; Lee et al. 2008; Yun and Kim 2008), and green tourism using mountain village amenities was explored (Han 2001; Jeon et al. 2007; Han and Seol 2008).

In the 2010s, studies investigated measures to boost mountain eco-village development (Kim et al. 2013b; Chang et al. 2014; Kim and Seo 2014a), including the development of a program for urban–rural exchange in mountain villages (Seo and Lee 2010; Kim and Seo 2013; Seo et al. 2015). In addition, the motivation and satisfaction factors related to return migration to mountain villages were assessed (Kim et al. 2013a; Roh et al. 2013; Kim and Seo 2014b; Min and Kim 2014). Other studies developed a classification model to establish a forest carbon cycle community (Seo et al. 2011; Kwak and Seo 2012). The projected need and prospects for forestry workers was also assessed (Jeong et al. 2010; Kim et al. 2010). These publications demonstrate the extent to which research trends and scholarly views regarding Korean mountain villages have changed over time.

The surface area of mountain villages covers 44% of the total land mass and 55% of forested areas in South Korea. Yet, mountain village populations account for only 3% of the national population.[1)] Nonetheless, the functions and roles of mountain villages are diversifying owing to an influx of return migrants. As a result, agricultural productivity, albeit still low, is increasing, along with the expansion of urban-rural exchanges, promotion and growth of ecotourism, and building of an ecofriendly forest carbon cycle community. However, mountain village populations continue to decline, with the average household income being half that of the national level. Just 7.6% of mountain village households use forest resources (i.e., 52,000 out of 682,000 mountain village households). Moreover, the lack of projects tailored to specific mountain villages and of entities capable of managing such projects are strongly undermining development projects in these villages. Consequently, living conditions have yet to improve.

In light of this background, this study aims to comprehend the changes in the resources, population, and economies of Korean mountain villages at the national scale. Specifically, we identify shifting trends for certain parameters by comparatively analyzing data from two national surveys on mountain villages, conducted in 2003 and 2014. The investigated parameters include village development projects, forest resources, population size, economic statistics, exchange between mountain villages and cities, tourism resources, and master planning. Through this analysis, the present study suggests a method of establishing realistic and efficient mountain village development policy based on the above-described changes in mountain villages in Korea over time.

1) Similarly, mountain villages in Japan account for 50% and 60% of all land mass and forested areas, respectively, but only 3% of the population reside in them. Despite these similarities, there are limitations to comparing Korea with Japan, as the latter has a different type and use of forest resources. Further, in contrast to Korea, China has an extensive land area, complex natural geographical conditions, and a different climate (Nam and Song 2013).

1 Methods

By using the 2003 and 2014 mountain village survey data, we performed comparative analyses of the distribution and use of forest resources, demographic trends in mountain villages, the economic situation of mountain villages, exchange between mountain villages and urban regions, the use of forest resources for green tourism and ecotourism, and considerations for master planning for mountain village development. The survey results were statistically analyzed by using PASW 18.0 (SPSS Inc., Chicago, IL, US), and the chi-square goodness-of-fit test, correlation analysis, chi-square independence test, and independent samples *t*-test were conducted at the 5% significance level.

In particular, the chi-square goodness-of-fit test was used to analyze the suitability of the expected and observed frequencies of the changes in village development projects, used forest resources, and production management organization in mountain villages. Correlation analysis was used to assess the extent of the effect of the annual sales of each forest resource on income creation. The chi-square independence test was used to identify statistical differences between the national average and mountain villages in terms of certain properties such as population by age group; farms by scale or management type; green and ecological tourism resource facilities; and education, medical, and welfare facilities. Lastly, the independent samples *t*-test was used to analyze statistical differences in average household and farm income by year.

1.1 Background of the mountain village development in Korea

The Korean government defines a "mountain village" as a village located in a remote, low-population, mountainous region with extensive forest areas, where residents have a low income and live in harsh conditions, owing to vulnerable industrial infrastructure and their exclusion from social, economic, and cultural cohesion. More specifically, classification criteria in the 1996 mountain village survey were a ≥ 70% ratio of forested land to total land, a ≥ 26% ratio of arable land to total land, and ≤ 1.44 person/km^2 population density. When the national *Forest Basic Law* was enacted in 2001, the classification criteria were changed to ≥ 70% ratio of forest area to *si*/*gun* (cities and counties) and *eup*/*myeon* (sub-districts), a ratio of arable land lower than the national *eup*/*myeon* average, and a population density below the national *eup*/*myeon* average (Korea Forest Service 2015a). In 2001, the total area occupied by mountain villages in Korea was 45.9% (4570 thousand ha) of the total land area in the country and 56.7% (3692 thousand ha) of the total forestland. The arable land of mountain villages represented 26.1% (533 thousand ha) of the total arable land. By contrast, mountain village populations represented 4.6% (1,940,000 inhabitants) of the total population.

To improve the conditions of mountain villages, the government launched its mountain village development support program in a single village in 1995 (as a pilot project for the modernization of agricultural, forestry, and fishery villages) in the pursuit of balanced land development, efficient use and management of forest resources, and improvement in the income of residents. After initial setbacks and budgeting problems owing to the lack of a legal foundation, the enactment of the *Forest Basic Law* (January 1, 2002) and revision of the *Forestry and Mountain Villages Development Promotion Act* (July 1, 2002) provided the basis for establishing detailed regulations governing the support projects of mountain villages. These laws facilitated the systematic and stable implementation of the overall program. The government conducted national surveys in mountain villages during 2003 and 2014 to obtain the necessary baseline data for the efficient implementation of these mountain village development policies and the formulation of a master plan (Korea Forest Service 2015a).

1.2 Current state of the mountain village development

When the Korean mountain village development support program was established in 1995, it targeted 4972 mountain villages spread over 119 *si*/*gun* and 508 *eup*/*myeon* nationally. Four categories of mountain villages were included in the program based on regional characteristics: "recreation-leisure type," "forestry income type,"

"agriculture-forestry tandem type," and "comprehensive development type." By 2010, project funds amounting to 310.1 million USD (or around 1.3 million USD/village) had been invested in 240 villages (17,614 households). The project funds (70% from the central government and 30% from local governments) were used for living environment improvement (106.3 million USD; 34%), production infrastructure development (103.2 million USD; 33%), green experience facilities (75.9 million USD; 25%), and other (24.7 million USD; 8%). Different levels of support were provided to each village based on the number of households (Seo et al. 2013).

Living environment improvement involves bettering residential conditions through various activities such as paving village roads, maintaining rivers, improving street lighting, constructing sewage treatment facilities, planting trees on avenues, and establishing community centers. Production infrastructure development mainly involved short-term income boosting efforts and structures such as low-temperature refrigerators, income-generating crop production zones (e.g., for mushrooms and wild greens), and forest product storage places. Green experience facilities included accommodation and hands-on experience facilities, forest spas, and hiking trails. "Other" projects included house retrofitting and building, the education of residents, village leader training, website construction, and village public relations activities (Kang 2004).

Subsequently, the *Special Act on Balanced National Development* was revised. This revision was implemented as a result of problems arising from improper facility operation and management and projects that overlapped with regional development projects by other government departments as well as to stimulate the involvement of local governments in project efforts. As a result, the control of the budget related to the mountain village development support program was transferred from the Korea Forest Service to the Ministry of Food, Agriculture, Forestry, and Fisheries (under the General Rural Development Program in the Agriculture, Forestry, and Fishery Sectors) and municipal and local governments (under the Special Situation Regional Development Program). Following this change, the mountain village development support program was comprehensively implemented through a series of regional development projects, extending beyond the village level. Between 1995 and 2012, the support program was implemented in 312 mountain villages (Korea Forest Research Institute 2003; Korea Forest Service 2014a; Seo and Kim 2014, 2015).

Meanwhile, the Korean government assessed the level of satisfaction on a five-point scale in the development projects implemented in mountain villages. A score of 3.5 was reported for living environment improvement projects, 3.3 for production infrastructure projects, 3.1 for green experience facilities projects, and 3.0 for home improvement projects. Problems in executing the projects were identified as driven by (1) insufficient income sources for pursuing facilities-based projects such as living environment improvement; (2) not being able to fully realize each village's uniqueness and capabilities because of the adoption of a government-led, top-down approach for project execution following the uniform allocation of project funding for each mountain village (Li et al. 2013); and (3) a lack of follow-up management in the form of consulting and facilities' upgrade after the completion of projects (Korea Forest Service 2016).

Legislation requires a national survey of mountain villages every 10 years. The first survey was conducted in 2003, followed by a second survey in 2014. At the time of the first survey, there were 15,277 villages belonging to 163 *si*/*gun* and 1415 *eup*/*myeon* nationally. Of these villages, 4977 belonging to 508 *eup*/*myeon* of 119 *si*/*gun* were surveyed. Pursuant to Article 3 of the *Forest Basic Law* and Article 2 of the *Enforcement Decree* of the same law, the second survey was conducted on mountain villages belonging to 466 *eup*/*myeon* of 109 *si*/*gun*. The first survey contained items on the distribution and use of forests and arable land, village distribution and population change trends, green tourism and ecotourism resources, agriculture and forestry commodities production infrastructure, healthcare facilities, educational facilities, amenities, and other items. The second survey contained items on the distribution and use of forest resources, village population trends, the economic situation, village-urban exchange, green tourism and ecotourism resources, and other items. Economic aspects were added to the second survey

as new items, including the evaluation of mountain village income and labor force (return migrators and multicultural settlers) and urban-rural exchange years (Korea Forest Service 2014a, b, d).

2 Results and Discussion

2.1 General state of mountain villages and development projects

In 2012, South Korean forestland (6422 thousand ha) accounted for 64% of total land (10,019 thousand ha). Thirty-four percent of *eup*/*myeon* contain mountain villages (466 out of 1381; Figure 1). South Korea belongs to the temperate climate zone, with an average annual temperature of 12.5°C, annual precipitation of 1113 mm, and 33 annual snowfall days. Mountain villages are located at an average elevation of 248 m (range: 137–484 m) (Korea Forest Service 2014b).

In 2012, the government-run mountain village development support program had been

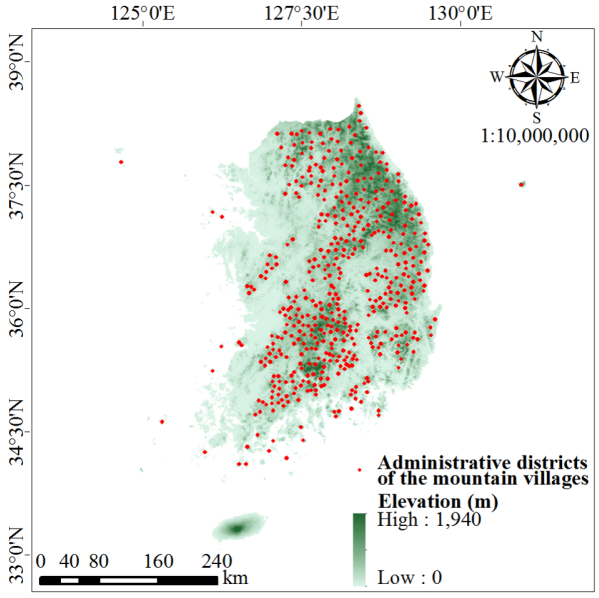


Figure 1 Administrative districts of mountain villages in South Korea.

Note: The administrative districts are in units of *eup*/*myeon* and the locations are marked as the center of the administrative district that corresponds to each mountain village. The spatial resolution of the South Korean digital elevation model, serving as the background, was 30 m × 30 m. Most of the administrative districts of mountain villages in South Korea are located in high-elevation mountainous areas.

implemented at 3123 sites. The preferences of certain businesses from various village development projects showed statistical significance at the national level ($p < 0.001$). The most frequently supported projects were local government projects (23.5%), followed by green experience village development (18.9%), comprehensive rural village development (11.5%), general agro-fishery village development (11.2%), and forest eco-village development (10.0%). Many types of government-supported village development projects were carried out in 1142 mountain villages, representing 36.5% of the projects conducted nationwide. The most frequent village development projects were forest eco-villages (23.8%), followed by green experience villages (18.7%) and local government projects (18.0%). Each village development project that targeted mountain villages showed statistical significance, suggesting a distinct preference by businesses ($p < 0.001$). Of the projects implemented nationwide, 36.5% were government-supported mountain village development projects. Specifically, in decreasing order of relative frequency, supported projects included forest eco-villages (87.2% of the national total), general agro-fishery villages (39.0%), info network villages (37.6%), green experience villages (36.2%), and village landscaping (36.0%) (Table 1).

Green experience village projects, one of the major government-funded village development projects in Korea, started in 2002 with the aim of promoting agricultural values by using natural resources such as environmentally friendly agriculture, the natural landscape, and traditional culture; increasing farm income; and forming and restoring agricultural communities. For this project, 850 cases are planned by 2017. The agro-forestry village project was established in 2004 to create a pleasant rural settlement area by improving the landscape of mountain villages, maintaining the living environment, and establishing an income infrastructure to maintain rural society and promote balanced development in rural and urban areas. For this project, 1000 cases are planned by 2017. The forest eco-village project was established in 1995 and 312 cases were planned by 2012, but the project was transferred to another department. The agro-fishery village project was conducted on 300 villages from 2005 to 2011 and in 337 regions

Table 1 Government-subsidized village development projects (Unit: n)

Category	Total	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	x^2 [a]
Nationwide (A)	3132 (100.0)	735 (23.5)	591 (18.9)	361 (11.5)	351 (11.2)	312 (10.0)	290 (9.3)	273 (8.7)	144 (4.6)	75 (2.4)	963.868***
Mountain villages (B)	1142 (100.0)	205 (18.0)	214 (18.7)	83 (7.3)	137 (12.0)	272 (23.8)	109 (9.5)	56 (4.9)	39 (3.4)	27 (2.4)	471.459***
B/A (%)	36.5	27.9	36.2	23.0	39.0	87.2	37.6	20.5	27.1	36.0	

Notes: (1) = Local government projects; (2) = Green experience village projects; (3) = Agro-forestry village projects; (4) = Agro-fishery village projects; (5) = Forest eco-village projects; (6) = Info network village projects; (7) = Farm stay village projects; (8) = Theme farm village projects; (9) = Village land-scaping projects. [a] Chi square goodness-of-fit test, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$. Values in parentheses are percentages.

from 2011 to 2014. The aim of the project was to increase the income of residents and the basic standard of living in agricultural, mountain, and fishing villages as well as to promote specialized regional development and maintain the population in agricultural, mountain, and fishing villages by increasing amenities and planned developments. The info network village project was established in 2001 to establish an Internet service by constructing a super-highway in agricultural, mountain, and fishing villages isolated from information as well as e-commerce and informative content to promote the local economy. This project was conducted in 357 villages by 2015.[2)] Further, 18 agricultural, mountain, and fishing village projects are being conducted by the Korean government in 2016 including general village development projects, theme park establishment projects, rural village establishment projects, farm village overall development support projects, urban–rural interchange promotion projects, farm and fishing village community promotion projects, and the fishing village vitality settlement project run by the Ministry of Agriculture, Food, and Rural Affairs (Korea Rural Community Corporation 2013).

However, no project targeted for mountain villages has thus far considered the distinctiveness of such villages. In particular, although the Korea Forest Service, the department associated with mountain villages, partly subsidizes the labor costs of mountain village operation managers and specialty sales consulting, developmental projects that require a large budget for facilities investment are not being conducted. This is because of the *Special Act on Balanced National Development* (revised April 2007), which introduced an inclusive subsidy system that consolidated the mountain village development projects conducted by the Korea Forest Service with those of the Ministry of Agriculture, Food, and Rural Affairs and the Ministry of Government Administration and Home Affairs.

2.2 Distribution and use of forest resources

The overall national land area used by humans slightly increased from 9,955 thousand ha in 2001 to 10,020 thousand ha in 2012 owing to the creation of reclaimed land, whereas the area of agricultural and forestland slightly decreased. The total area occupied by mountain villages decreased by 206 thousand ha, changing from 4,570 thousand ha in 2001 to 4,364 thousand ha in 2012, as did the area of agricultural and forestland, accounting for 10.8% and 80.9% of the total land area in 2012, respectively. By contrast, land use for orchards increased from 10 thousand ha in 2001 to 12 thousand ha in 2012. In terms of the ratio of land used for a specific purpose to total area, mountain villages dropped 2.3 percentage points (from 45.9% to 43.6%). The area of agricultural and forestland decreased from 26.1% and 56.7% to 24.3% and 55.0%, respectively, because of the construction of roads, factories, military facilities, and communication and electrical facilities. By contrast, the percentage of land area occupied by orchards increased from 18.5% to 20.0% after it was converted to grow crops with a higher value than rice and other previous harvests (Table 2).

The entire forestland area of the country slightly decreased from 6510 thousand ha in 2001 to 6422 thousand ha in 2012. In 2001, the percentage of forest ownership was 22.1%, 7.5%, and 70.3% for national, public, and private forests,

2) However, government-funded village development projects were conducted by various bodies without consistency, as seen in the neglect of the characteristics of mountain villages and overlap in investment. Therefore, the Korea Forest Service plans to conduct development projects and funding related to such projects concerning mountain villages by other departments.

Table 2 Change of forest distribution in nationwide (A) and mountain villages (B)

Factor		2001		2012	
		A	B	A	B
Land-use type (thousand ha)	Agriculture	2043	533	1949	473
	Forest	6510	3692	6422	3529
	Orchard	54	10	60	12
	Pasture	56	14	58	13
	Other	1292	321	1531	337
	Total	9955	4570	10,020	4364
Forest ownership (thousand ha)	National forest	1441	1124	1543	1163
	Public forest	491	328	488	310
	Private forest	4578	2240	4391	2056
	Total	6510	3692	6422	3529
Number of owners (thousand persons)	< 1 ha	1738	482	1609	404
	1-5 ha	517	300	578	240
	5-10 ha	150	89	110	69
	10-50 ha	84	45	63	38
	≥ 50 ha	25	7	5	5
	Total	2514	923	2365	756
Age class# (thousand ha)	I	510	256	161	101
	II	1311	742	466	200
	III	2345	1377	1396	668
	IV	1293	889	2262	1523
	V	384	352	1388	677
	≥ VI	120	100	492	270
	Total	5963	3716	6165	3439

Note: # Age class I, II, III, IV, V, and VI represent 1–10 years, 11–20 years, 21–30 years, 31–40 years, 41–50 years, and 51–60 years, respectively.

respectively. In 2012, owing to the aggressive purchase of private forests by the government and government-driven exchange operations, the area of government-owned forestland increased by 1.9 percentage points. Consequently, the area of forestland belonging to mountain villages decreased by 163 thousand ha over the 11-year period, changing from 3,692 thousand ha in 2001 to 3,529 thousand ha in 2012. By contrast, the area of government-owned forestland increased by 2.6 percentage points (39 thousand ha). In other words, the areas of all national, public, and private forestland decreased during this period (Table 2) because of converting forestland into farmland and grassland for agricultural use as well as for non-agricultural use such as for mines and for building factories, roads, golf courses, ski resorts, and cemeteries. Between 2010 and 2014, the average annual area converted in those five years was 8,721 ha (Korea Forest Service 2015b).

When looking at the changing trends in the area of forestland based on forest type, the total area of artificial forests increased by 47 thousand ha, changing from 1,666 thousand ha in 2001 to 1,713 thousand ha in 2012. In terms of canopy composition, the percentage of coniferous, deciduous, and mixed trees was 41.4%, 25.7%, and 30.6%, respectively in 2001. However, by 2012, the percentage of coniferous trees had decreased by 1.2 percentage points, whereas deciduous and mixed tree cover had increased by 1.1 and 2.3 percentage points, respectively. Changes in the forest type and canopy cover of mountain villages differed from that of forestland as a whole. In mountain villages, the amount of artificial forest cover decreased considerably, changing from 917 thousand ha in 2001 to 534 thousand ha in 2012. Canopy composition changed from 39.9%, 30.2%, and 29.5% for coniferous, deciduous, and mixed, respectively in 2001 to 36.6%, 38.4%, and 24.8%, respectively in 2012. Thus, the percentage of coniferous and mixed tree cover decreased by 3.3 and 4.7 percentage points in 2012, respectively, whereas that of deciduous trees increased by as much as 8.2 percentage points. Overall, the proportion of artificial forest area accounted for by mountain villages decreased by as much as 23.8 percentage points, changing from 55.0% in 2001 to 31.2% in 2012. In 2012, while the percentage of coniferous and mixed tree cover decreased, the percentage of deciduous trees increased by 12.1 percentage points (Korea Forest Service 2014a). An examination of the five-year afforestation between 2010 and 2014 showed that the number of broadleaf trees (57,652 ha) such as *Betula platyphylla* var. *japonica* (East Asian white birch) and *Quercus acutissima* (Sawtooth oak) planted was higher than the number of conifers (49,909 ha) such as *Pinus densiflora* (Korean red pine) and *Pinus koraiensis* (Korean pine) (Korea Forest Service 2015b).

The number of forest owners at the national level decreased by around 149,000, changing from 2,514,000 in 2001 to 2,365,000 in 2012. Most owners who ceded ownership were small holders (< 1 ha; n = 129,000). Relatively small-scale holders (< 1 ha and 1–5 ha) account for the

majority of private forest owners in Korea (69.1% and 20.6%, respectively in 2001). In 2012, only the number of 1–5 ha forestland owners increased (by 3.8 percentage points), with the numbers of landowners decreasing for all other categories. The number of forestland owners inhabiting mountain villages decreased from 923,000 in 2001 to 756,000 in 2012. This decrease was greater than the overall national decrease in inhabitants from villages (167,000 vs. 149,000), especially in terms of small-scale owners (< 5 ha, or < 1 ha and 1–5 ha; n = 138,000). Based on size class, < 1 ha and 10–50 ha classes slightly increased, whereas the rest decreased. The ratio of forestland owners in mountain villages to owners nationwide decreased from 36.7% in 2001 to 32.0% in 2012, presumably as a result of the aggressive purchasing of private forestland by the Korean Forest Service between 2001 and 2012 (117,680 ha in all) (Korea Forest Service 2014c). In contrast to small-scale owners, the percentage of all owners in the ≥ 5 ha class, who were mountain village residents, was very high (60.3%–100.0%), implying that relatively large-scale forestland ownership is dominant in mountain villages (Table 2).

In 2001, the dominant forest age classes nationally were II and III, with 22.0% and 39.3% coverage, respectively. In 2012, the dominant age classes rose, with III and IV accounting for 22.6% and 36.7% coverage, respectively. In mountain villages, age classes III and IV dominated in 2001, with 37.1% and 23.9% coverage, respectively, and rose to IV and V in 2012, with 44.3% and 19.7% coverage, respectively. Age classes IV and V represented 64% of total age classes in mountain villages by 2012, exceeding the national level (59.2%). The ratio of mountain village forestland area to national forestland area by age class decreased by 6.5 percentage points, changing from 62.3% in 2001 to 55.8% in 2012. In 2012, the ratio of all classes, except for I, decreased, with classes I and IV accounting for 62.7% and 67.3% forestland area, respectively (Table 2). Here, the increase in age classes IV and V was driven by the forestry industry that began in earnest in the late 1970s in Korea, as thinning was needed for long-diameter log production.

In 2012, 132,485 households used forest resources across the country, most frequently fruit trees (40.8%), followed by wild greens (19.7%); as such, there is a statistical significance in the preferences of the use of certain forest resources at the national level ($p < 0.001$). The percentage of mountain village households that used forest resources was 39.3% (n = 52,070), most frequently fruit trees (44.5%), followed by wild greens (24.0%) and forest mushrooms (9.4%), again showing a statistical significance ($p < 0.001$). In terms of the mountain village-national ratio, a higher percentage of mountain villages used sap (63.0%), forest mushrooms (60.2%), wild greens (48.1%), cultivated mountain ginseng (47.1%), and fruit trees (44.5%). Given that the mountain village population is only 2.8% of the entire population, the mountain village use of forest resources was high, even given their ease of access (Table 3). This finding can be attributed to an increase in demand for safe foods, which coincided with an increase in national income, as well as because of the perception that the foods produced in the clean forest area are safer. Meanwhile, a correlation analysis of the annual household income from mountain villages in the past three years showed that medicinal plants ($p < 0.01$), wild greens ($p < 0.01$), fruit trees ($p < 0.05$), and lumber ($p < 0.05$) most affected total household income (Table 3).

The forest-related national budget in 2014 was around 2183.4 million USD. While forest products yielded 6277.3 million USD, this amount decreased to 2911.2 million USD when soil/stone (1091.7 million USD) and timber (2274.4 million USD) were excluded. These forest products were separated into landscape trees (694.7 million USD), fruit trees (653.3 million USD), medicinal plants (449.2 million USD), timber (354.4 million USD), wild greens (337.2 million USD), and forest mushrooms (178.4 million USD) (Korea Forest Service 2014c). Assuming that all 52,070 households that used forest resources between 2010 and 2012 also sold them, estimated annual sales were 1364.3 million USD, which breaks down into fruit trees (866.2 million USD), wild greens (233.8 million USD), forest mushrooms (100.1 million USD), landscape trees (61.7 million USD), medicinal plants (60.3 million USD), and timber (13.9 million USD). This quantity corresponds to 46.9% of all national forest products in 2014 (2911.2 million USD), excluding soil/stone and timber (Table 3).

Table 3 Number of households that use commercialized forest resources and their average annual sales in nationwide (A) and mountain villages (B) (Unit: n)

Category		Total	Fruit trees	Wild greens	Wild-life	Medicinal plants	Land-scape trees	Forest mush-rooms	Lumber	Sap	Cultivated mountain ginseng	Other	x^2 [a]
2012	A	132,485 (100.0)	54,002 (40.8)	26,053 (19.7)	12,717 (9.6)	9259 (7.0)	9190 (6.9)	8096 (6.1)	3401 (2.6)	3312 (2.5)	1983 (1.5)	4472 (3.4)	*172,371.74* ***
	B	52,070 (100.0)	23,194 (44.5)	12,521 (24.0)	370 (0.7)	3587 (6.9)	2752 (5.3)	4875 (9.4)	498 (1.0)	2086 (4.0)	934 (1.8)	1253 (2.4)	*91,221.999* ***
	B/A (%)	39.3	43.0	48.1	2.9	38.7	29.9	60.2	14.6	63.0	47.1	28.0	
Ann.-s1[b]		173.3 (100.0)	37.3 (21.4) (*0.655**)[c]	19.3 (11.1) (*0.779***)	10.6 (6.1) (*-0.047*)	16.7 (9.6) (*0.876***)	22.2 (12.8) (*0.586*)	20.8 (12.0) (*0.513*)	28.1 (16.2) (*0.640**)	5.8 (3.3) (*-0.102*)	7.6 (4.4) (*0.318*)	5.1 (2.9) (*0.016*)	
Ann.-s2		1,364,305 (100.0)	866,175 (63.5)	233,797 (17.1)	3800 (0.3)	60,280 (4.4)	61,664 (4.5)	100,131 (7.3)	13,948 (1.0)	11685 (0.9)	6976 (0.5)	5849 (0.4)	

Notes: Ann.-s1=Annual mean sales (2010-2012; thousand USD) by mountain village households; Ann.-s2=Annual sales (2012; thousand USD) by mountain villages;
[a] Chi-square goodness-of-fit test, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.
[b] Only mountain village households with forest resource sale records were included.
[c] Correlation coefficient for the total annual sales, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.
Other values in parentheses are percentages.

2.3 Changing trends of mountain village populations

Between 2001 and 2012, the Korean population increased by 8,781,000 (20.8%), changing from 42,167,000 in 2001 to 50,948,000 in 2012. The population composition by age group changed from 15–29 years (27.6%), 30–39 years (19.6%), and 40–49 years (14.5%) in 2001 to 50–64 years (20.1%), 15–29 years (19.9%), and 40–49 years (17.3%) in 2012. In other words, the percentage of middle-aged (40–64 years) and elderly (≥ 65 years) people increased by 6.4 and 3.7 percentage points, respectively. There is statistical significance in the changes in age distribution at the national level ($p < 0.001$). During the same period, the mountain village population decreased by 24.0% (n = 454,000), changing from 1,895,000 in 2001 to 1,441,000 in 2012. The population composition changed from ≥ 65 years (21.7%), 50–64 years (20.3%), and 15–29 years (19.6%) in 2001 to ≥ 65 years (29.2%), 50–64 years (25.8%), and 15–29 years (13.3%) in 2012. Thus, the 50–64 and ≥ 65 years age groups increased by 5.5 and 7.5 percentage points, respectively. Again, there is statistical significance in the changes in age distribution in mountain villages ($p < 0.001$). This result shows that compared with the urban population, the mountain village population is shrinking in absolute terms and in terms of aging. The percentage of the entire population that inhabited mountain villages decreased by 1.7 percentage points, changing from 4.5% in 2001 to 2.8% in 2012, decreasing more markedly for the ≥ 65 and 50–64 years age groups (2.7 and 5.2 percentage points, respectively). The percentage of households represented by mountain villages was only 3.4% in 2012; however, they represented 27.2% of all farming households nationally. This result shows the important role that mountain villages play in agricultural and forestry production (Table 4).

Between 2010 and 2012, 63,000 outmigrants (36,000 households) returned to mountain villages, with these numbers continuing to increase. Still, population and household return growth rates in mountain villages are lower than those of national rates. Mountain village households and population account for 52.8% and 55.6% of nationwide return migrants to rural areas, respectively. However, the number of return migrants to mountain villages over this three-year period represented just 4.4% of the mountain village population in 2012 (35,000 out of 1,441,000). Despite these small numbers, return migrants are important new human resources given the current reality of depopulation and aging in mountain villages (Figures 2a).

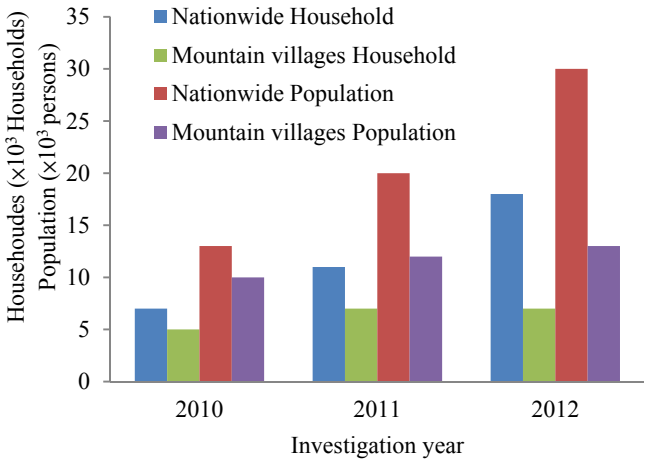
In Korea, a "multicultural settler" is a foreigner (non-Korean person) who has acquired Korean nationality and settled in Korea. In 2012, multicultural settler households and population numbered 95,000 and 283,000, respectively, corresponding to 8.4% and 4.6% of the national levels (Korea Forest Service 2014a). However, multicultural settlers in mountain villages (*n* =

Table 4 Population composition of nationwide (A) and mountain villages (B) with respect to household and age bracket (Unit: thousand persons)

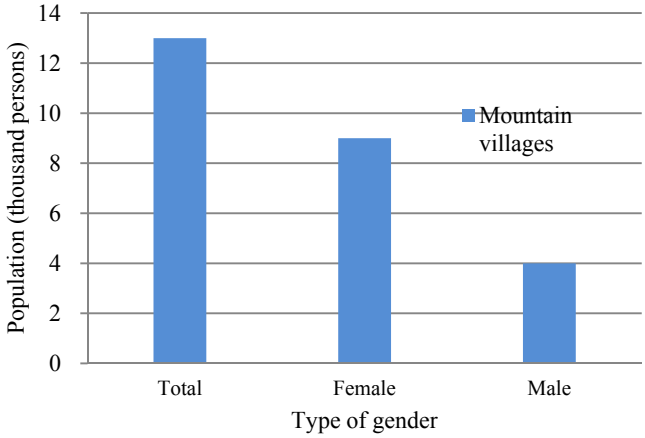
Category		Households (n)	Farming households (n)	Total	Youth	Young adulthood		Middle age		Old age	x^{2} [a]
					0–14	15–29	30–39	40–49	50–64	≥ 65	
A	2001	14,834 (100.0)	1335 (9.0)	42,167 (100.0)	5822 (13.8)	11,637 (27.6)	8280 (19.6)	6948 (16.5)	6108 (14.5)	3372 (8.0)	1522.712***
	2012	20,212 (100.0)	1151 (5.7)	50,948 (100.0)	7625 (15.0)	10,118 (19.9)	8169 (16.0)	8,836 (17.3)	10,220 (20.1)	5980 (11.7)	
B	2001	690 (100.0)	385 (55.8)	1895 (100.0)	250 (13.2)	371 (19.6)	221 (11.7)	257 (13.6)	384 (20.3)	412 (21.7)	63.707***
	2012	682 (100.0)	313 (45.9)	1441 (100.0)	137 (9.5)	191 (13.3)	131 (9.1)	189 (13.1)	372 (25.8)	421 (29.2)	
B/A (%)	2001	4.7	28.8	4.5	4.3	3.2	2.7	3.7	6.3	12.2	
	2012	3.4	27.2	2.8	1.8	1.9	1.6	2.1	3.6	7.0	

Notes: [a] Chi-square independence test, * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.
Values in parentheses are percentages.

13,000) represented 37.1% of mountain village return migrants (n = 35,000), meaning that they have high potential as a labor force source for agricultural and forestry commodities production and forest management in mountain villages. Women accounted for about 70% of multicultural settlers in mountain villages, most of who originate from Southeast Asian countries such as Vietnam and Cambodia and have married Korean men (Figure 2b).



(a) Households and population of return migrants



(b) Multicultural settler population (2012)

Figure 2 Return migrants to rural areas and multicultural settler state.

2.4 Economic statistics of mountain villages

The number of farm households owning arable land decreased by 13.8% nationwide, changing from 1,335,000 in 2001 to 1,151,000 in 2012. In terms of the scale of these operations, < 0.5 ha and 1–3 ha landowners represented 34.4% and 32.4% nationally in 2001, respectively. By 2012, the number of < 0.5 ha owners had increased to 42.2% (by 7.8 percentage points), with similar increases in the 3–5 ha and ≥ 5 ha groups (0.5 and 2.5 percentage points, respectively). Thus, < 0.5 ha farms are downsizing and ≥ 3 ha farms are growing in number, concurrently. There is statistical significance in the changes in the number of households by management type at the national level ($x^2 = 41.03$, $p < 0.001$). The overall number of farm households in mountain villages decreased by

18.7%, changing from 385,000 in 2001 to 313,000 in 2012. In 2001, arable landowners with < 0.5 ha and 0.5–1 ha farms represented 34.0% and 33.0% of the total in mountain villages. In 2012, while < 0.5 ha landowners had increased by 9.1 percentage points, other sizes had decreased, similar to the overall national trend. However, there is no statistical significance in the changes in the number of households by management type in mountain villages (x^2 = 6.98, p > 0.05). The ratio of overall arable land area occupied by mountain villages to the total national level slightly decreased in 2012 (27.2%) compared with 2001 (28.8%), with ≥ 5 ha holdings decreasing by 13.4 percentage points (Korea Forest Service 2014a).

Nationwide, the number of farm households decreased from 1,346,000 in 2001 to 1,138,000 in 2012. When considering product type, this decline was most marked in rice farming (9.0 percentage points, from 52.4% to 43.4%). By contrast, vegetables and fruits/nuts actually increased by 6.0 and 5.0 percentage points, respectively, changing from 17.9% to 23.9% and from 10.2% to 15.2%, respectively. There is statistical significance in the changes in the number of households by management type at the national level (x^2 = 71.84, p < 0.001). The number of farm households in mountain villages decreased by 21.7%, changing from 447,000 in 2001 to 350,000 in 2012. With respect to product type, rice decreased by 9.8 percentage points, (changing from 46.1% to 36.3%), while upland crops, vegetables, and fruits/nuts increased by 0.7 (from 17.9% to 18.6%), 2.6 (from 12.8% to 15.4%), and 4.9 percentage points (from 9.4% to 14.3%), respectively. However, there is no statistical significance in the changes in the number of households by management type in mountain villages (x^2 = 10.078, p > 0.05). Compared with 2001, the ratio of farm households in mountain villages to the national total decreased in 2012 for all farm types except livestock. Nevertheless, the percentage of upland crops, specialty crops, and livestock in mountain villages still ranged from 46.8 to 83.3% of the national levels. This result shows that mountain villages remained important for agricultural and livestock production and supply (Korea Forest Service 2014a).

The national average income per household increased by 30.0% in this period, changing from 30.4 thousand USD in 2001 to 39.5 thousand USD in 2012. The average income per farm household also increased by 30.0%, changing from 22.3 thousand USD in 2001 to 29.0 thousand USD in 2012. An average increase of 36.2% was documented in mountain village households (from 13.8 thousand USD to 18.8 thousand USD; p > 0.05) and 34.7% in farm households (from 11.8 thousand USD to 15.9 thousand USD; p > 0.05). However, there is no statistical significance in average household income and average farm household income in mountain villages by year. The income of mountain village households was just 45.4% of average household national income in 2001 and 47.5% of that in 2012. For farm households, income was 52.8% of the national average in 2001 and 54.9% of the national average in 2012. During the same period, the average income of farm households nationwide increased from about 73% of the national average to about 85%, showing a relative increase of about 12 percentage points (Table 5). The average household income and average farm household income of mountain villages are half the national average because of the existence of small-scale farmland in mountain villages, which leads to low productivity, a difficulty managing intensive operations because of an aging population and lack of labor force, and difficulties in the sale of products.

Table 5 Income statistics per household in nationwide (A) and mountain villages (B) (Unit: thousand USD)

Category		a	$t^{\#}$	b	t	b/a (%)
A	2001	30.4	-	22.3	-	73.5
	2012	39.5		29.0		73.3
B	2001	13.8	*-1.277*	11.8	*-1.303*	85.4
	2012	18.8		15.9		84.8
B/A (%)	2001	45.4		52.8		-
	2012	47.5		54.9		-

Notes: # Independent samples t-test, * p < 0.05, ** p < 0.01, and *** p <0.001. a = Average income per household; b = Average income per farming household.

There were 18,476 production management organizations nationwide in 2012, largely composed of corporate farming associations (48.0%) and co-ops (31.8%), thereby showing a distinct statistical preference in the type of product management organization established nationwide (x^2 = 19,695.507, p < 0.001). By comparison, mountain villages had only 2491 production

management organizations, which were dominated by corporate farming associations (88.8%). There is statistical significance in the preference for the type of production management organization in mountain villages (x^2 = 9355.748, p < 0.001). Total production scale was 615,062 thousand USD in mountain villages, with co-ops and corporate farming associations representing 59.8% and 39.0% production, respectively. Forest-related production in mountain villages amounted to 22,215 thousand USD, or only 3.6% of total production in 2012. Thus, corporate farming associations were the major production entity (89.3%) (Korea Forest Service 2014a).

2.5 Exchanges between mountain villages and cities

As of 2012, 670 people were working in mountain villages to organize urban–rural exchange operations, of whom 315 were operation organizers, 266 were involved in village management, and 89 were public–private partnerships. This shows that only 13.5% of 4972 mountain villages have operations management in the country. Of the national total of 4548 urban–rural exchanges, 681 (15%) involved mountain villages, either between enterprises (462 cases) or administrative agencies (255 cases) (Korea Forest Service 2014a). There is thus a need to increase urban–rural exchange agreements by expanding urban–rural labor exchange to promote mountain villages and increase their incomes.

2.6 Green tourism and ecotourism resources

The number of facilities related to green tourism and ecotourism including national parks and recreational forests increased more than threefold nationwide, from 205 in 2001 to 676 in 2012. With respect to facility type, there were 97 recreational forests (47.3% of facilities) and 53 province- and county-owned parks (25.9%) in 2001. By 2012, 55 additional recreational forests, 147 forest spas, and 55 forest camping grounds had been installed. There is statistical significance in the changes in facilities at the national level (x^2 = 168.745, p < 0.001). In 2011, mountain villages had 84 recreational forests (51.9%) and 53 province- and county-owned parks (32.7%), and 94 pleasure grounds (26.6%), 91 recreational forests (25.7%), and 64 forest camping grounds (18.1%). Compared with 2001, 48 forest spas and 57 forest camping grounds had been established nationwide by 2012 (Korea Forest Service 2014a). There is statistical significance in the changes in facilities in mountain villages (x^2 = 136.876, p < 0.001). This change may be attributed to the increased demand of people for health-promoting and leisure activities, owing to an increase in income per capita and quality of life.

2.7 Items required to establish a master plan

In 2001, Korea had 19,523 educational facilities consisting of kindergartens (42.7%), elementary schools (30.7%), and middle schools (14.7%). This number slightly increased in 2012 (to 20,477). Specifically, kindergartens and elementary schools decreased, whereas middle schools and above increased. There is statistical significance in the changes in educational facilities at the national level (x^2 = 83.322, p < 0.001). Mountain villages had 2,185 educational facilities in 2001: elementary schools (38.9%), kindergartens (33.1%), and middle schools (19.2%). By 2012, this number had fallen to 1,776 facilities, resulting in a decrease of 19%. Again, kindergartens and elementary schools slightly decreased, but middle schools and above increased. However, there is no statistical significance in the changes in educational facilities in mountain villages (x^2 = 5.651, p > 0.05). In 2012, educational facilities in mountain villages accounted for 8.7% of the national total, which was less than in 2001, with elementary schools and kindergartens decreasing by 3.3 and 1.9 percentage points, respectively (Korea Forest Service 2014a). This was driven not only by a decrease in the population of children aged 0–14 years, but also by a decrease in the population of young and middle-aged people, while a decrease in the educational facilities acted as a factor that made the inflow of new residents even more difficult.

A considerable decrease (20%) was observed in the number of healthcare facilities nationwide, changing from 51,281 in 2001 to 41,500 in 2012. This decline was primarily owing to a decrease in oriental medicine clinics and pharmacies. As such, there is statistical significance in the changes in

medical facilities at the national level (x^2 = 1022.496, p < 0.001). By contrast, healthcare facilities in mountain villages slightly increased, changing from 1677 in 2001 to 1702 in 2012. This change was primarily the result of the construction of new hospitals. The penetration rate of healthcare services in mountain villages in 2001 was 49.1% (824) for community health centers, 32.4% (544) for oriental medicine clinics and pharmacies, and 18.4% (309) for hospitals. By 2012, these values were 40.7% (693), 36.5% (622), and 22.7% (384), respectively. In other words, the number of community health centers decreased, whereas the number of healthcare facilities increased. As such, there is statistical significance in the changes in medical facilities in mountain villages (x^2 = 25.088, p < 0.001). The ratio of healthcare facilities located in mountain villages to the national level increased from 3.3% in 2001 to 4.1% in 2012. Thus, the ratio of community health centers decreased, whereas that of oriental medicine clinics and pharmacies more than tripled owing to the overall national decline (Korea Forest Service 2014a). As shown, the increase in the number of hospitals, Korean medical clinics, and pharmacies serves as a factor that prevents migration out of mountain villages and induces population influx from cities.

The number of welfare facilities nationwide increased 2.7-fold by 2012 (n = 138,190) compared with 2001 (n = 50,387). This change was primarily the result of an increase in the number of community welfare centers, child daycare centers, and fitness facilities. As such, there is statistical significance in the changes in welfare facilities at the national level (x^2 = 31,017.545, p < 0.001). By contrast, the prevalence of welfare facilities in mountain villages decreased by more than half, changing from 32.8% of the national total in 2001 to 14.1% in 2012. As such, there is statistical significance in the changes in welfare facilities in mountain villages (x^2 = 1221.625, p < 0.001). However, the number of public bathhouses, child daycare centers, and fitness facilities increased considerably (75.2%-513.0% of 2001 levels). This increase presumably occurred to provide adequate care for infants and aged residents. The decrease in village product sales centers may be explained by the establishment of county-level medium- and large-scale sales centers and improved transportation owing to higher automobile distribution (Korea Forest Service 2014a).

3 Conclusions

This study used nationwide survey data to conduct a macroscopic analysis to identify the extent to which the changes in mountain villages in South Korea have affected the implementation of promotion policies and to measure their effectiveness. Since 2014, agricultural, mountain, and fishing village development projects in Korea have been conducted by various organizations including the Ministry of Agriculture, Food, and Rural Affairs, Ministry of Government Administration and Home Affairs, and Korea Forest Service. Therefore, the diversity and distinctiveness of the region has been insufficiently considered because of biased approaches, investment overlap, and top-down incentives (Fazlur-Rahman 2007; Kang 2007; Li et al. 2013).

The Korean government conducted surveys of mountain villagers in 2003 and 2014, obtaining basic data to address the fact that the social, cultural, and economic conditions of mountain villagers are inferior to those of urban dwellers. This study evaluates the outcomes of these two surveys. We find that investment overlap by government organizations on mountain villages should be prevented; in particular, mountain villages require development projects that consider distinct village-level characteristics. Therefore, the government should aim to establish a foundation for the Korea Forest Ministry to create policies for mountain village development and conduct projects in a consistent manner (Kessler 2008).

Further, as forestland ownership in mountain villages rapidly declines, it is necessary to enhance productivity and implement measures to expand the scale of operations. Since expanded forestland management is needed to care for tree growing stocks of age classes IV and V, certain forestland management operations should focus on development, such as forest road construction and forest tending. Furthermore, forest resources that can be directly collected and cultivated by mountain villagers have a competitive advantage over other resources. In relation to forest resources, a solution to expand Korean lumber demand should be found, perhaps by developing lumber

bio-energy and promoting lumbar housing construction to increase use.

With mountain villages being subject to rapid depopulation and aging, return migrants and multicultural settlers are expected to provide a source of new labor; however, their actual participation in and attitudes toward agricultural and forestry production and management activities need to be ascertained to quantify their potential as a solution to the human resource problems in mountain villages. Further, there is a need to lease both residential space and national forest to create income from forestry and thus increase the chance of settlement in those relocating to rural areas. This would contribute to increasing household income in mountain villages.

Moreover, the scale of agricultural operations is increasingly being downsized, with the average income of farm households in mountain villages being half that of farm households nationwide. Therefore, it is important to expand the organization of food production efforts in mountain villages, which currently account for just 3.6% of the national total. Securing human resources for operation management is essential for promoting agricultural and forestry product sales through urban–rural exchange and expanding the experience horizons of mountain villagers. In addition, alternative land use should be considered such as the creation of "healing forests for human beings" or pleasure grounds using the abundant forest resources of mountain villages, or for the processing of various forest products directly collectable and cultivatable (e.g., wild greens, medicinal plants, and mushrooms). Another promising avenue is the fostering of further settlement by expanding education, healthcare, and welfare facilities and the expansion of government-supported, village-specific development projects. Finally, while mountain villages in Korea are effectively performing their function as a supply base for agricultural and livestock products, it is necessary to enhance the levels of forest management operations such as forest tending and forest road construction.

As mentioned above, mountain villages currently have several problems. However, if the solutions presented were pursued as a master plan for national policies to support mountain villages, it would be possible to advance mountain villages via maintenance/conservation of their unique culture, demonstration of the value of forests and forest villages to the country and its population, maintenance of healthy forest ecosystems, improving forest functions that provide public benefit, and 6th industry development of forest villages, including production of clean forest products, manufacture, experiences, leisure, and healing. Furthermore, this could produce additional benefits when looking at the country as a whole, such as balanced land development and efficient management/use of forest resources.

This study is subject to a number of limitations. Since the nationwide survey data are based on regional statistical data or simple household surveys, a more in-depth assessment of policies using such data is relatively difficult than when using case studies. Indeed, case studies with in-depth inquiry can offer the opportunity to unite quantitative and qualitative information and provide more information for policy evaluation (Lincoln 1995; Neef et al. 2006; Baker 2011; Midmore et al. 2010; Li et al. 2013). Therefore, there is an urgent need for regular, scheduled, and periodic long-term nationwide surveys that use existing methodologies in addition to in-depth inquiry into case files to establish, effectively implement, and assess policies for a balanced development between cities and rural mountain villages.

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