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A Prospective and Sustainable Forestry Job Development in Korea*

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산림분야 새로운 일자리 개발에 관한 분석적 연구

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Abstract

The purposes of this study were to analyze the long-term trends for the outlook for job development in the forestry sector and to identify supply and demand on job markets. Due to the results of the studies of the forest area would be focused on area of forest therapy and guide, forest biomass research, researcher on prevention & control of forest pests, technician for forest protection, expert in forest disaster prevention, investigating of overseas tree species, and similarly the qualification items should be given more in trees and or bio-energy producer, forest saver and preventer, forest therapist and guide, tree pesticide doctor, forestry job regulator, etc. The main implication of the study result is that the reason of climate changes, environment pollutions and green-energy productivity would push the conditions of job market trend in forest workforce area.

Key words: Forestry Job development, Prospective Forest Job

국문초록

이 연구의 목적은 미래 산림분야의 유망한 장기 일자리를 분석하고, 산림분야 일자리 수요-공급에 따른 유망한 일자리를 제안하는 데 있다. 연구방법으로는 산림분야 일반/전문직업을 도출하기 위해 전문가 델파이 연구 결과와 관련연구 결과를 비교, 분석 하였다. 연구결과 선정된 일자리는 최근 관심이 높아지고 있는 의료 및 복지와 관련된 직업, 산림 자체를 유지・관리・보호하는 직업, 기후변화에 따른 새로운 자원으로써 산림에서 구할 수 있는 유기물을 활용한 자원개발과 관련된 직업 등이었다.

주요어: 산림 일자리 개발, 산림분야 유망직업

1. Introduction

According to the *Statistical Yearbook of Forestry* (Korea Forest Service, 2011), Korea's national land area amounts to 10,003,000ha as of the end of 2010 and its substantive forest area is 6,369,000ha, accounting for 63.3% in 2015 of the national land. Korea ranked the 4th in its forest rate following Finland (72.9%), Japan (68.5%), and Sweden (68.7%) among the member countries of Organization for Economic Cooperation and Development (OECD). Thus, Koreans are living near forests than any other

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nation in the world. Nonetheless, the nation is lacking in sufficient utilization and management of forest resources in many ways and is heavily dependent on imports in a substantial part of forest resources. The amount of imported forest products almost doubled from $1,799 million in 2001 to $3,352 million in 2010 (Korea Forest Service; KFS, 2011). Fortunately, efforts thus far have steadily increased in the self-sufficiency ratio of forest products from 5.8% in 2001 to 13.5% in 2010. However, the nation's dependence on overseas forest resources is still high. Recently, the demand for forest-based leisure activities and improved health will rise, as will the expectation that forests will continue to provide a variety of ecological functions to provide environmental services such as carbon sequestration, clean air and water.

Above all, skilled workers who lead the forest industry are an essential element for conservation and sustainable development of all types of forests worldwide. In a tripartite meeting comprised of labor, management and government sectors from the perspective of social and labor for the development of forestry and wood industry held in Geneva in 2001, a consensus was made that decent work in the forest industries has potential to realize all social, economic, and environmental sustainability and such work also contributes greatly to economic viability, including the environmental and social benefits deriving from forests (International Labor Organization, 2001). However, due to working environments and conditions different from other industries, employees in the forest industry area are under the harsh environments and globally the employment rates of the industry are on the decline. Poschen(1997), an ILO expert in sustainable development, noted that the employment rates of Finland, Sweden, and New Zealand decreased by more than 10% in the 1990s and predicted that globally more than 5% of the employees (4,700 million as of 2001) would lose their jobs if we do not aware of the issues such as forest extraction limit, depletion of natural resources, and mergers and acquisitions and restructuring of businesses. Major reasons for such situation include (1) demand for forest products is declining compared to the past, (2) technological changes that play a core role in industrial development influence operation systems, employment, labor organizations, and human resources, and (3) annual working hours are decreasing compared to productivity due to industrialization (Peter, peter, & Matis, 2003).

This information, In Korea, state-led forest rehabilitation projects were implemented for rehabilitation of the degraded forests. Furthermore, legal and institutional preparations were included for forest management. As stipulated in the Framework Act on Forest in 2001, the national forest plan was established and will be upgraded every 10 years. The diminished job market in the forest sector has engendered an urgent need to re-engineer innovative means to make forestry attractive. The fact is that although there has been improvement in labor conditions and income, high employment instability in forest industry still remains and many forestry jobs provide sporadic, part-time, and seasonal employment. Ensuring adequate protection, training and education of the workforce and facilitating social dialogue among employers, workers, and the government can help tackle these deficits and realize the potential for sustainable employment and decent work conditions within the industry. An educated and skilled workforce is vital to the forest industry, supporting innovation, productivity and economic growth. Unfortunately, like other sectors in the economy, labor and skills shortages are a major challenge for the forest industry in Korea. Over the next few years the forest sector will see some key challenges and opportunities. The forest products industry is a growing, technology-based industry. The forest industry attracts a variety of skilled workers. Environmental work is an important aspect of the forest industry and many jobs involve managing resources, maintaining parks, delivering public education or determining the environmental impact of forest development. The facts mentioned above indicate that there is a great need for the training of forestry technicians and the shortage of technicians was found to be a major obstacle in the development of national and field services of public forestry administrations. Korea's forest sector has forecasted a looming shortage of skilled forest technicians.

In this regard, the study's goal is to analyze the long-term trends for the outlook for career opportunities in the forestry sector, identifying supply and demand on job markets. The study was carried out by using a Delphi approach and compared the previous studies results, which is an explanation, but experimental iterative process using expert group estimates on deriving

sustainable jobs in the forestry sector to evaluate each job competency, prioritize the list generated in phase one, and identify the "core" job competencies representative of those used for the management and utilization of forest resources as of previous studies done.

2. Background and Previous Studies

2.1. Statement background

Under the national forest plan, the Korea Forest Service(KFS) enhances a systematic foundation for sustainable forest management and provides forest benefits for the public. Based on foundations and frameworks established under the Fourth Plan, the Fifth National Forest Plan has been designed to further expand the implementation of sustainable forest management in pursuit of maximizing forest functions. In implementing the Plan, the KFS continues to establish a foundation for a sustainable welfare society by developing environmental and social resources, and to pursue forest related industries. The KFS has made efforts to nurture the forestry profession and stabilize employment for over a decade by institutionalizing fostering of forestry technicians as a profession and to promote their employment by establishing "a long-term forestry education and training promotion plan". However, there are still many issues that need to be addressed in order to create sufficient numbers of decent and productive jobs in the forest sector. At this point, table 1 shows the Green job market prospective each industry from 2009 year to 2016 year by Korea Forest Service. Here the two key words would be derived of "energy" and "environment" which could get possibility to be a decent job in forest area.

The KFS focuses on promoting the implementation of forest conservation and management, fitting for the purpose of achieving well-balanced land development and conservation. It also plays a central role in natural disaster prevention efforts, by improving ecosystem health and vitality and contributing to public safety and environment conservation. It further highlights forest's recreational and cultural functions for improving quality of life and living environments both in urban areas and mountain villages as well as providing welfare benefits for the people. As a result of these efforts, the forest industry in Korea is facing an increased need for skilled forestry workers and allied professionals who advocate for ecologically sound forest practices. However, the forest industry requires a large labor force for mostly low wage jobs. In addition to low wage industries and lack of economic opportunity in particularly forestry, labor shortages in forestry has quickly become crucial to the implementation of sustainable forest management. In addition, Table 2 shows the green jobs and outlooks and their tasks from Ministry of Labor Force, which jobs are shown their demands to the future as of trends.

In this regard, the technical and traditional areas of workforce in forest are outlooks as well as in table 2, In addition the forest recreation and cultural facilities play an important role in the development of forest resources and forest industry for they not only enable the public to enjoy the multiple benefits of forests but also instill the value and importance of forests. The forest recreation and cultural facilities are environmentally sound facilities providing healthy recreation and emotional relaxation for the public. These facilities include: recreation forests; forest bathing

〈Table 1〉 The Prospective Green-job by Each Industry

(thousand, %)

classified	2009		2016		('09~'16)	year %(±)
	employed no.	%	employed no.	%		
Energy resource area	300	51.3	354	48.1	54	2.4
Energy High efficiency- rate area	7	1.3	11	1.5	4	5.9
Industry-green space area	34	5.8	66	9.0	33	10.1
Environment protect resource cir. area	506	86.4	602	81.6	96	2.5
Less pollution economic area	21	3.5	26	3.5	5	3.2
Green-job area	585	100.0	737	100.0	152	3.4

Source: Korea Forest Service (2012). p.85.

〈Table 2〉 Green Jobs and Its Outlooks and Their Tasks and Roles in Korea Job Information System

Job name	Tasks and role	Job outlooks
bio-energy researcher, controller	energy gaining and utilizing from animal and plant night soil treatment, waste treatment	increasing (100%), maintaining (0%), decreasing (0%)
forest researcher	horticulture seed development, plant development and cultivating innovation and experimental affairs	increasing (40%), maintaining (40%), decreasing (20%)
forest technician	suppling forest technology, quality control and test, insect and disease control and other various task conducting in forest fields.	increasing (46%), maintaining (47%), decreasing (7%)
landscape architecture	landscape architecture planning, commercial project, park, house golf residence course and forest resort development tasks conduct.	increasing (30%), maintaining (52%), decreasing (17%)
landscape technician	flowering and planting to tree-lined street, park, and garden; carrying and digging holes for planting and multi-tasks for raising nature	increasing (56%), maintaining (26%), decreasing (16%)
afforestation & logging worker	controling main and side products in forest, and carrying, erosion control working, transporting and conserving afforestating development and other tasks	increasing (50%), maintaining (23%), decreasing (27%)

Source: Ministry of Labor(2012). in Korea Job Information System. Retrieved May 16, 2012, from http://www.work.go.kr/consltJobCarpa/srch/jobInfoSrch/srchJobInfo.do

area in the suburbs equipped with hiking trails, simple outdoor athletic facilities, educational centers built within 10ha of forest; forest museums which provide development of forest culture, education and research through preservation and exhibition of historical materials; and forest arboretums that preserve genetic resources of native species and rare varieties of plants.

2.2. Relative study compliance

The studies of forest fields job were referenced which entitled 'The Manpower Development & Professional Workforce Careers in Forest Fields' by Korea Forest Service(2012); 'A Study of the Employment Policies and Outlooks of the Forest and Green Jobs Area' by shinn(2012b); 'Current Status and Outlooks for Forest Related Qualifications in Korea' by Shinn(2014b); 'A Study on the Development of the New Qualification Items of the Forest Fields in Korea' by Shinn(2014c); 'A Study of the Legislation for Job Creation and Employment Support in the Forest Area' by Shinn(2014a); 'A Study of Potential Future Occupations in Forest Fields' by Shinn (2012a), which studies would be supported by literature and historical in this study results.

3. Research Methodology

3.1. Research design

In this study, the expert questionnaire survey has been adopted as the study method. The content of the questionnaire shall serve as a basis for research data analysis and study of content validity and reliability of the sustainable professional development in Korean forestry. In a preliminary stage, we reviewed the list of the emerging forestry jobs generated from the literature review. A final list of candidate jobs was generated and a two-round Delphi survey process followed. The Delphi method adopted for formulating the expert forecast on emerging jobs in the forestry area consisted in two survey rounds. In this matter, the Delphi method(Dalkey, 1969; Delbecq et al., 1975) was used in order to reach a broad consensus and to avoid non-scientifically founded opinions.

3.2. Expert panel

In contrast, if various reference groups are involved in a Delphi study, more subjects are anticipated to be needed. Dalkey (1969) also noted that at least 10 panel members were needed in order to minimize errors and maximize reliability.

In this study, the Delphi expert panel members were divided into two groups as below. For this study 10 panel members including 5 human resource development specialists and 5 researchers and professors in the area of forestry were selected. In order to appropriately select professional panels in the relevant areas, their representatives, appropriateness, professional knowledge and capabilities, and faithfulness in participation were carefully considered. The panelist expert fields were presented in Table 3.

〈Table 3〉 Composition of Panel of Experts

Expert type	Number
Human Resource Development Specialist	5
Forestry Professionals	5

3.3. Quantifying of consensus among panelists

In order to determine the degree of consensus among the Delphi panel members, descriptive statistics were used to calculate central tendency and variability: (1) *mean* (M) as central tendency; and (2) *standard deviation* (SD) as variability. Mean is the average of a five-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (5) as used by Leedy and Ormrod (2001). In this study, content validity was used to determine consensus. One widely used method of measuring content validity was developed by Lawshe (1975). The consensus among panelists on the necessity to include a specific component can be quantified by determining the content validity ratio (CVR). The content validity ratio is one of the earliest and most widely used methods for quantifying content validity.

3.4. Identifying categories of forestry professionals

In a preliminary stage, in order to identify professional jobs in the forestry area, we analyzed recent trends of labor resources in the forest sector, the current status of employees in the area and employment volumes of those from the forest science and relevant departments, and KFS's employment policies and data. In addition, socio-economic mega trends, forecasting human resource demand and supply, and green job policies and outlooks were reviewed. As a result, a total of 16 jobs were identified as shown in Table 4. The derived jobs were categorized into 7 areas based on their job characteristics. Thus, a final list of candidate job factors was generated and a two-round Delphi survey process followed.

3.5. Dephi round 1

The main purpose of the first round of the study was to identify various emerging issues of sustainable professional development in Korean forestry, which could serve as the basis for the subsequent round. All of the panelists were supplied a document including background information and a cover letter explaining the study; expert's response to the questionnaire was considered their consent for participation. Ten experts were approached and agreed to participate in the study. Panelists reviewed the list of professionals generated from the previous research and were asked to suggest additional factors based on their knowledge of the literature and experience with human

〈Table 4〉 Identified Professional Jobs in the Forestry Area

Areas	Job Name
Health and Medical Services	Forest therapist & Forest therapist guide
	Forest wellness coach
Renewable Energies	Forest biomass researcher
Environment and Climate Change	Carbon emission right trading broker
	Management consultant for climate change response
R&D	Researcher on forest bioresources
	Researcher on prevention & control of forest pests
	Researcher on functional food & forest products
	Researcher on wildlife
	Researcher on forest resource breeding
Preservation and Management of Forest Resources	Technician for forest ecological restoration
	Technician for forest protection
	Expert in forest disaster prevention
Education	Expert in forest education
Forest Amenities and Cultural Assets	Researcher on forest ecological amenities
	Excavator and manager of forest cultural assets

〈Table 5〉 Descriptive Statistics of Combined Panel Ratings and CVR Values of the Respective Judgments, Delphi Round 1

Areas	Job Name	Mean	SD	CVR
Health and Medical Service	Forest therapist & forest therapist guide	3.6	1.27	0.2
	Forest wellness coach	3.2	1.23	−0.2
Renewable Energies	Forest biomass researcher	4.3	1.34	0.6
Environment and Climate Change	Carbon emission right trading broker	2.7	1.42	−0.2
	Management consultant for climate change response	2.9	1.10	−0.4
R&D	*Researcher on forest bio resources	4.3	1.25	0.8
	Researcher on prevention & control of forest pests	4.1	1.29	0.6
	Researcher on functional food & forest products	3	0.94	−0.8
	Researcher on wildlife	3.6	1.17	0
Preservation and Management of Forest Resources	Researcher on forest resource breeding	4.2	1.03	0.6
	*Technician for forest ecological restoration	4.4	0.70	0.8
	Technician for forest protection	4	1.05	0.4
Education	Expert in forest disaster prevention	3.7	1.42	0.2
	Expert in forest education	3.6	0.84	0.2
Forest Amenities and Cultural Assets	Researcher on forest ecological amenities	3.8	0.92	0.4
	Excavator and manager of forest cultural assets	3.5	0.71	0.2

Note: * Selected for the first round, based on a CVR score of ≥ 0.62
Source: Korea Forest Service (2012). p. 124.

resource development initiatives.

In this round experts were given complete freedom in their response and are invited to generate ideas. In this step, in order to development more items, one item related to any factor was presented to panel members. Then they were asked to write the similar cases that occur during their tasks and working environment. Experts were also asked to comment on the items. Then, the first draft of the questionnaire was complete based on the experts' feedback from this round and the information obtained from the experts was used to assess content validity of the forestry professionals, which used the second data was adopted to this study.

3.6. Delphi round 2

The first draft of the questionnaire was then sent to the experts to obtain their final confirmation and the persons who responded to the first round were only included in the second round. The main goal of this round was to build consensus by identifying areas of agreement among the Delphi panel members. Each member was asked to evaluate questions according to the perceived importance they placed on each item. After the analysis of the first round, the included questions, i.e. items that obtained more than half of the experts' agreement, were sent back to the experts along with the percentage of agreement for each item. The information obtained from the experts was used to assess content validity of the forestry professionals, which used the second data was adopted to this study.

4. Results

This study adopted the Delphi technique due its ability to generate consensus on forestry professionals to deal with complex problems among varied interest groups (Hsu and Sandford, 2007). A Delphi survey was conducted on a panel of 10 experts in order to look at whether the suggested jobs were valid as professional jobs in the forestry area. The first round of Delphi survey was asked whether the initial 16 jobs derived were valid as professional jobs in the area. In the second round of the Delphi survey, experts' opinions from the first round of the Delphi survey were reflected; names of jobs were revised and the five new jobs were presented as professional jobs by the experts. Then the second round of the Delphi survey was conducted on 21 jobs. Tables 4 and 5 show the first and second rounds of the Delphi process, respectively.

According to the result of the first round of Delphi survey, the mean score ranged from 2.7 to 4.4, and the CVR ranged from -0.2 to 0.8. A relatively small group of ten expert panelists needs to display a relatively high consensus on the validity of the model and their consensus needs to reflected in a Content Validity Rate (CVR) value higher than 0.62. This value could also be loosely related to the opinion of Chadwick et al. (1984), who proposed that a reliability coefficient of 0.6 or above for a content analysis would be regard as acceptable (Lawshe, 1975; Leedy et al., 2001). Panelists indicated their rating for each job based on a "Likert type" scale with "1" representing strongly disagree, "2" representing disagree, "3" representing neither agree nor disagree, "4"representing agree, and "5" representing strongly agree. The resulting mean rating, SD and CVR value from Delphi Round 1 are presented in Table 5.

After the first round of the Delphi survey, "*Researchers on forest bioresource"* and "*Technicians for forest ecological restoration"* reached a high consensus (CVR $\geq$0.62). In addition, the combined panel identified five to be important based on the experts' feedback from this round. These five recommended jobs were: *"Researcher on climate change response & forest environment", "Researcher on eco-friendly wood processing", "Researcher on forest engineering", "Investigator of overseas tree species", and "Tree doctor".* These 5 jobs were then included to the list to be rated in the following round and the Delphi panel would review and consider these additions in the subsequent round.

For the second-round of the Delphi survey, participants were provided with a summary of the group responses resulting from the first-round survey. The introduction of the cumulative results generated by previous round has been historically offered in the final probe of the Delphi studies to sustain the validation of group consensus (Delbecq, et al., 1975). In doing so, closure is provided as areas of common ground and any divergence can be more readily identified. With the results revealed, panelists were asked to once again consider the importance of the 14 jobs that did not achieve consensus in Round 1.

〈Table 6〉 Descriptive Statistics of Combined Panel Ratings and CVR Values of the Respective Judgments, Delphi Round 2.

Areas	Job Name	Mean	SD	CVR
Health and Medical Service	Forest therapist & forest therapist guide[a]	4.2	0.63	0.8
	Forest wellness coach	3.0	0.94	−0.2
Renewable Energies	Forest biomass researcher[a]	4.4	1.27	0.8
Environment and Climate Change	Carbon emission right trading broker	2.9	0.99	−0.2
	Management consultant for climate change response	2.7	0.95	−0.4
	*Researcher on climate change response & forest environment	3.8	1.03	0.2
R&D	Researcher on forest bio resources[a]	4.3	1.25	0.8
	Researcher on prevention & control of forest pests[a]	4.3	1.25	0.8
	Researcher on functional food & forest products	2.8	0.78	−0.8
	*Researcher on eco-friendly wood processing	3.8	1.03	0.2
	*Researcher on forest engineering	3.7	1.06	0
	Researcher on wildlife	3.7	1.25	0.4
Preservation and Management of Forest Resources	Researcher on forest resource breeding[a]	4.3	0.95	0.8
	Technician for forest ecological restoration[a]	4.6	0.52	1
	Technician for forest protection[a]	4.4	0.69	0.8
	Expert in forest disaster prevention[a]	4.3	0.68	0.8
	*Investigator of overseas tree species[a]	4.2	0.63	0.8
	*Tree doctor[a]	4.3	0.76	0.8
Education	Expert in forest education	3.7	0.48	0.4
Forest Amenities and Cultural Assets	Researcher on forest ecological amenities[a]	4.2	0.63	0.8
	Excavator and manager of forest cultural assets	3.7	0.68	0.2

Note: *Suggested for the second round, based on a recommendation from the first round
[a]CVR score $\geq$ 0.62 in the second round

〈Table 7〉 Identified Jobs from the Delphi Panel Member with a High Consensus

(CVR ≥0.62)

Areas	Job Name	Meana	SD	CVR
Health and Medical Service	Forest therapist & forest therapist guide	4.2	0.63	0.8
Renewable Energies	Forest biomass researcher	4.4	1.27	0.8
R&D	Researcher on forest bio resources	4.3	1.25	0.8
	Researcher on prevention & control of forest pests	4.3	1.25	0.8
	Researcher on forest resource breeding	4.3	0.95	0.8
Preservation and Management of Forest Resources	Technician for forest ecological restoration	4.6	0.52	1
	Technician for forest protection	4.4	0.69	0.8
	Expert in forest disaster prevention	4.3	0.68	0.8
	Investigator of overseas tree species	4.2	0.63	0.8
	Tree doctor	4.3	0.76	0.8
Forest Amenities and Cultural Assets	Researcher on forest ecological amenities	4.2	0.63	0.8

Note: a 1=none acceptable, 3=moderate, 5=very acceptable

The second Delphi round directed the ten panels to rate the criticality of the 21 forestry professionals that were deemed to be of importance in round one, including the five recommended jobs offered by panelists. Once all ten panelists completed this round, the data were first analyzed to determine the degree of perceived importance (Mean), followed by the determination of whether a consensus was reached among the panel of experts (CVR).

The second round resulted in the inclusion of 5 suggested items related to forestry professionals, making the total number of items included in the questionnaire 21 items.

Determining a consensus can be accomplished by examining the content validity range (CVR) of the ratings of each of the items. For the purposes of this study, consensus needs to reflected in a Content Validity Rate (CVR) value higher than 0.62. Therefore, consensus was reached as defined by a CVR equal to or greater than 0.62 (greater than or equal to 0.62). Table 5 presents the descriptive statistics of the combined panel ratings of Delphi Round 2. Ten of the jobs did not achieve a consensus of rating within a group of panel member with a CVR of less than 0.62, while an absolute consensus was realized in 11 of the 21 jobs. According to the second round of the Delphi survey, the mean value and CVR were 2.7 to 4.6 and -0.8 to 1.0, respectively. After the second round of the Delphi survey result, 11 items that could receive high consensus as to be valid as professional jobs in the forestry area. Table 7 shows 11 professional jobs in the 5 forestry areas were confirmed as high ranked by the two Delphi surveys.

To sum up the results, we believe that heightened demand for forest sector jobs selected by experts will help increase the overall job prospects for forest workers. All forest workers in particular can expect increased demand as their expertise is required for the ongoing community forestry initiatives in Korea. New green issues will increase investments in conservation programs which will contribute to job growth for this sector. The use of forests to sequester carbon emissions will create a need for foresters with expertise in this area. The desire to develop renewable forms of energy will also increase the need for wood and other biomass products. Emerging specializations in the field such as urban forestry are also expected to result in new jobs. All things considered, employment prospects for forest will grow, albeit at a slower than average rate compared to the average profession, over the upcoming decade.

The other evidence for forest job development would be considered in the table 8 which is the forest areas job qualification items. Mainly forest protection and energy related area qualifications were higher scored than traditional or technical oriented job titles.

In the qualification items of applicable and prospective forestry jobs are forest saver and preventer, forest therapist and guide, and tree pesticide doctor represented in each, this means the three qualifications' demands are highly increasing in the forest job

〈Table 8〉 An Analyzed Selection for Possibilities of Applicable and Growth in the New Qualification Items of Forest Jobs

Qualification items	Applicable		Growable	
	Meana	SD	Meana	SD
Trees and or bio-energy producer	3.05	.846	3.80	.909
Forest bio-resource conductor	3.10	.929	3.25	.889
Forest preventive and or pesticide controller	3.45	.863	3.40	.974
Forest nursing and recoverer	2.97	1.010	3.13	.937
Forest machinery operator	3.15	.839	3.10	.953
Saw technician	1.95	.826	2.15	.803
Log sawer and controller	2.34	.884	2.55	.805
Forest saver and preventer	3.75	.886	3.03	1.000
Forest stuffs deliverer	2.20	.916	2.53	.834
Forest therapist and guide	3.50	.917	4.24	.852
Foreign-tree pesticide preventer	3.38	.902	2.98	.839
Tree pesticide doctor	3.98	1.008	4.50	.793
Forestry service operator	3.05	.990	3.50	.845
Forestry job regulator	3.25	.919	3.98	.909
Forest Supervisor	3.00	.831	3.55	.889
Mean	3.07	.904	3.35	.882

a 1=none acceptable, 3=moderate, 5=very acceptable
Source: Shinn, Y. H. & Lee, G. N.(2014c). p.96

market in Korea, and also the study shows the similar trends in the Delphi result.

5. Conclusions

This study was conducted to suggest a number of sustainable workforce strategies for Korean forestry that could be considered as promising in stimulating job creation and feasible for making forestry even more attractive and nurturing the forestry profession and employment. This study was an essential first step for setting the direction of making future design for sustainable green growth through implementing collaborative forest management. For this purpose, a Delphi method composed of two rounds was employed and the results showed that the descriptive statistics such as mean and content validity analysis of the panel ratings of Delphi Round 1 and 2 were most highly significant on job areas related to forestry and those panels participated had the strongest consensus on the growing prospect of the forestry-related job cluster among those various job categories evaluated.

On the basis of the findings, as most prospective future occupations in forest fields were selected forest biomass researchers, researchers of forest pest control, researchers of forest resource breeding, forest ecological restoration technicians, forest protection technicians, forest disaster experts, forest therapists/doctors, foreign species surveyors, forest researchers of biological resources and amenity researchers of forest ecology. Furthermore, the highly demanded job qualifications were found as those related to wood nurse and therapist, forest therapist and guide, forest business meister, care-taker for prevention and control of forest pests, most of which had been also shown as having a relatively high consensus in terms of future job priorities in the previous study of "Current Status and Outlooks for Forest Related Qualifications in Korea"(Shinn, 2014; Shinn & Lee, 2012). The overall comparison between this Delphi study and previous ones suggests that there is a strong similarity in that the most prospective jobs in the field of forestry are found as such jobs as forest nurse and therapist, forest therapist and guide, forest business meister, care-taker for prevention and control of forest pests, foreign species surveyors, forest researchers of biological resources and amenity researchers.

The main implication of this study is that the emerging factors such as climate changes, environment pollutions and green-energy

productivity, which are increasingly considered important for the future of man, would push more towards the direction of an echo-friendly sustainable growth the conditions and trend of job market in forest workforce area as well as the other industries, and that our major findings regarding the most highly demanded future job qualifications in the field of forestry can provide an important insight into identifying the attractiveness of forest-based employment as well as those future forest-related job areas requiring further attention by policy makers and industry professionals. Thus, it can be concluded that in future policy making and job creating in the forest area should place more focus on such job areas as forest therapy and guide, forest biomass research, researcher on prevention and control of forest pests, technician for forest protection, expert in forest disaster prevention, investigator of overseas tree species, and etc, because a few relevant studies including this study are indicating that those forest-related job areas are prospected as the most highly demanded in future.

Despite some useful findings, there are some limitations in this study. Above all, this study employed a Delphi method composed of two rounds and the total number of the professional participated in the survey was only 10 and as well this study drew upon those considerable data derived from other related studies, which could put a significant limitation on the reliability and generalization of this study findings. Besides, the list of job areas and positions used in this study may not fully represent all the jobs related to the field of forestry and thus the validity of this study might be threatened. Therefore, any further research regarding this area would be of great usefulness if the research would employ more rigorous sample design and research method and identify more specific future jobs and those qualifications required for them.

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