

Status in Employment in the Agricultural Sector and Analysis Demand Factors : Evidence from Gangwon, South Korea

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강원도 농업부문 고용인력 실태 및 수요 결정요인 분석

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ABSTRACT : 계획적이고 안정적인 영농을 위해 영농작업 인력을 확보하는 것은 매우 중요하다. 하지만 농가인구의 감소로 인한 농업인력 확보의 어려움과 농업노동 임금의 지속적인 증가는 경영주에게 이중의 고통이 되고 있다. 따라서 본 연구에서는 농가처분가능소득이 전국에서 가장 높은 강원도를 지역 표집으로 선정하여 Bivariate Probit 모형을 이용해 내국인과 외국인 고용의 상호 관계를 고려한 고용인력 수요 결정요인을 살펴보았다. 분석결과, 첫째, 3개월 이상 노동력을 고용하는 농가들의 경우 내국인 고용수요와 외국인 고용수요 간에는 양(+)의 상관관계가 있는 것으로 나타났다. 둘째, 전형적인 도시근교 농업의 특징을 나타내는 춘천시에 비해 강원도내 타 지역 농가들은 다른 변수들이 일정할 경우 내국인과 외국인의 고용수요가 증가하는 것으로 나타났다. 셋째, 젊은 경영주일수록 내국인 상시 고용에 대한 수요가 높고, 농가조직에 참여하고 있는 농가일수록 자가노동 확률은 0.13% 감소하고, 상시 농업 노동력에 대한 수요가 증가하는 것으로 나타났다. 이러한 분석 결과를 종합한 농업 노동력 확보를 위한 정책적 시사점으로는 첫째, 상시고용된 농업인력들을 대상으로 국내외 문화 차이를 인지하고, 내국인 노동자와 외국인 노동자간의 협력 네트워크 구축을 위한 영농교육 확대가 필요하다. 둘째, 각 지역별로 내국인 또는 외국인 노동자의 상시고용 수요가 상이한 것으로 나타나 강원도내 지역별 농산업 현황을 기반으로 「(가칭)강원도 농업 인력 수급 플랫폼」 구축이 필요하다. 셋째, 청년창업농과 농가조직 참여 농가들을 대상으로 농작업 상시고용 인력을 우선적으로 매칭해 주는 것이 필요하다.

Key words : Bivariate Probit Model, Labor Force Employment, Gangwon.

I. Introduction

Over the past 20 years, the agricultural, forestry, and fishery labor force has been steadily decreasing by 1.5% per year. Regarding the agricultural labor force, there has been a 2.3% decrease per year. Because of this, the ratio of farming households from total households has decreased from 15.6% in 1990 to 5.7% in 2015. The farming labor force ratio to total population has decreased from 15.5% in 1990 to 5.0% in 2015. On the other hand, the aging

phenomenon in the farming labor force has rapidly increased. Farms with owners over 65 years old have rapidly increased from 11.5% in 1990 to 38.4% in 2015. This decrease in the farming labor force and the aging of farmer results in quantitative and qualitative transitions in the agricultural labor force. The above signifies a decrease in the superior quality labor force in agriculture and leads to the increased labor employment. In reality, the average time of annual employment has increased from 131.1 hours in 2011 to 152.5 hours in 2015.

In general, the employed labor force is categorized as regular or temporal employment. Regular employment includes both domestic and foreign laborers. For the farm

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owner to employ foreign labor in regular employment, he or she must demonstrate effort to employ domestic workers for more than 14 days. If the owner cannot hire domestic workers, then the owner can apply to hire foreign workers. In addition, the government implemented a seasonal work system beginning in September 2015 to incorporate seasonal aspects in agriculture. Therefore, to establish efficient practices for foreign workforce employment in agriculture in consideration of periodic factors and political goals to expand farm income and solve labor deficiencies, a prioritized observation of employment demand factors by employment period is required (e.g. employment below three months being short-term and employment over three months being mid- to long-term). Furthermore, it is necessary to seek political alternatives based on observed factors.

Generally, studies on agricultural labor forces focused on categorizing domestic and foreign workers, and proposed improvements for employment and management. Amongst this research, a study by Shin et al. (2013) presents employment demands between farms with older owners and farms with younger owners using the agricultural census of 2010, and indicates that the age of the owners influences the farms' employment demands. Jang-Lee (2011) observes the employment procurement methods in outdoor vegetable farms, and suggests the necessity of developing a responsive agricultural labor force system by regional unit. In addition to the above, one study proposes the implementation of a foreign labor force in the livestock industry and controlled agriculture, which have high demands for foreign labor (Lee, 1999). Another study proposes an active intervention by the government to solve issues in labor force supply and demand by observing the procurement methods of the labor force by farm size (Kim, 2015). However, despite the intimate connection between domestic and foreign employment, the number of studies that examine the factors that influence the demand by considering this correlation between domestic and foreign employment is sparse.

In light of such context, this paper examines the reality of agricultural employment in the labor force in general, and the decisive factors in employment demands by considering the correlation between domestic and foreign labor employment targeting farms based in agricultural and rural affairs in Gangwon in 2015. However, the agricultural

industry varies in regional characteristics by its nature, and the features of individual farms and owners may have a significant influence on agricultural management methods. Therefore, Gangwon, a region with highest agricultural disposal income in the nation, was selected for this research as a target sample. This is because the definition of the employed labor force is explained through labor exchanged in currency values in the labor market by agricultural entities to invest in agricultural production (Kim, 2015) and the conditions of employment is relatively convenient when agricultural disposal income is higher in value.

II. Agricultural Employment Policies and Employment Demand Status of South Korea

1. Examining Major Policies in Agricultural Labor Force Employment

Due to growth-centered economic policies of the 1960s, the Metropolitan population has sharply increased while the agricultural labor force has faced a decrease in population. Due to the inadequate supply of labor force in rural areas, the government implemented an industrial trainee policy in agricultural industries in 2002. From 2003, foreign agricultural trainees started to enter South Korea. Then, since the enactment of 'the Act on the Employment of Foreign Workers', an employment license system and a trainee employment system have been in operation concurrently. From the year 2007, the two systems were consolidated into a single employment license system. Recently, seasonal employment policy has been under demonstrative implementation since 2015 to resolve the labor force deficiency during farming seasons. The nationwide program implementation was initiated beginning this year. The purpose of the Seasonal Employment Program is to utilize foreign workers under short-term stay (C-4) in the agriculture industry to resolve the labor force deficiency in aging rural areas, and to expand both farming income and foreign workers' incomes¹⁾.

South Korea is currently implementing a closed policy for foreign worker employment. Therefore, agricultural

divisions and business operations hiring foreign laborers was restricted under the law. The particular business types that can hire foreign workers in the agricultural industry are crop farming, livestock husbandry, businesses operating agricultural sorting and dehydrating plants, and agricultural servicing businesses. The number of employees is limited by the scale of the business, and by one site per particular business section. When measuring the business scale of farms, the harvest area and storage capacity are calculated to determine the business scale for food crop farming and livestock husbandry. In other business types, divisions use the number of regular employment to calculate the business scale. The maximum number of allowed foreign workers in a business operation of any magnitude cannot exceed 20.

Meanwhile, in regards to 'The employment license system' in the agricultural industry, countries such as Vietnam, Thailand, Cambodia and Myanmar have been designated a status of 'Special Countries'. This designation

of special countries in foreign employment lowers the risk of employment breakaway, and enables easier work adaptation for foreign workers in the Korean agricultural environment (Lee-Song, 2016). However, the number of foreign workers in Korea who come through the employment license system in the agricultural industry only accounts for around 6,159 persons. This produces fierce competition and illegal workforce dispatch amongst businesses. Furthermore, the issue causes wage and labor force discrepancies between livestock husbandry and crop farming businesses, and creates an imbalance in employment demands amongst farms.

The workers wage level in agriculture is higher when compared to the daily wage level in cities and blue-collared employment in small-sized manufacturers. In particular, the male wage in agriculture is 1.39 times higher than production labor in small-sized manufacturers, and 1.14 times higher when compared to daily wages in

Table 1. Number of Limited Foreign Labor Force by Farming Scale

 Unit: m²

Classification		Farm Size				
Crop Planting	Facilities Horticulture	4,000~6,499	6,500~11,499	11,500~16,499	16,500~21,499	More than 21,500
	Facilities Mushroom	1,000~1,699	1,700~3,099	3,100~4,499	4,500~5,899	More than 5,900
	Fruit	20,000~39,999	40,000~79,999	80,000~119,999	120,000~159,999	More than 160,000
	Ginseng, Vegetables	160,000~29,999	30,000~49,999	50,000~69,999	70,000~89,999	More than 90,000
	Bean sprouts, etc.	200~349	350~649	650~949	950~1,249	More than 1,250
	Other	12,000~19,499	19,500~34,499	34,500~49,499	49,500~64,499	More than 64,500
Livestock	Dairy Cattle	1,400~2,399	2,400~4,399	4,400~6,399	6,400~8,399	More than 8,400
	Beef Cattle	3,000~4,999	5,000~8,999	9,000~12,999	13,000~16,999	More than 17,000
	Pig	1,000~1,999	2,000~3,999	4,000~5,999	6,000~7,999	More than 8,000
	Horse etc.	250~499	500~999	1,000~1,499	1,500~1,999	More than 2,000
	Poultry	2,000~3,499	3,500~6,499	6,500~9,499	9,500~12,499	More than 12,500
	Other	700~1,699	1,700~3,699	3,700~5,699	5,700~7,699	More than 7,700
Allowable employees		Less than 5	Less than 8	Less than 10	Less than 15	Less than 20

 Source: https://www.eps.go.kr/kr/sub/sub03_01_05_contents.jsp.

Table 2. Granting Certificate of Issuance of Visa for Foreign Employment Permit System

Unit: The number of person

Classification	Crop Planting (E-9-3)		Livestock (E-9-8)	
	2014	2015	2014	2015
Total	5,958	5,524	267	635
Vietnam	580	333	19	80
Thailand	798	594	73	70
Cambodia	2,614	2,548	68	140
Myanmar	637	684	30	102
Other	1,329	1,365	77	243

Source: Ministry of Employment and Labor(2017)

cities. Regarding female wages in agriculture, the wage level itself was higher when compared to daily-wages in cities and blue collared employment in manufacturing plants until the early 2000s, but since 2010, the wage level has been lower than the above comparisons. Considering the annual wage increments per annum in the wage-based labor force over the past 20 years, male wages in agriculture showed the highest increase of 10.2%, followed by production workers in manufacturing plants at 10.1%, daily wages in city jobs at 9.3%, and female wages in agriculture at 9.1%.

Amongst farms overall, the proportion of farms hiring a

labor force has decreased from 27.4% in 2010 to 23.0% in 2015. Regarding the employment rate by employment period, temporal employment under a one month period in farms accounts for the majority, but the proportion itself is decreasing. In 2015, 16.2% of the total farms hired temporal workers under a one month period. Farms hiring workers for more than three months is at 2.6%, but its ratio is on the rise. As such, the increasing number of farms with workers hired for over a three-month period indicates the increase in demand for acquiring a stable agricultural labor force.

When examining the reality of agricultural employment,

Table 3. Wage Comparisons between Agricultural Labor and Others

Unit: KRW

Classification	Agriculture		City daily workers	Small manufacturing
	Man	Woman		
1995	33,237	23,791	30,900	23,942
2000	48,039	32,292	37,268	27,238
2005	58,955	40,043	52,838	38,077
2010	76,172	49,265	69,731	57,884
2015	101,220	66,968	88,686	72,326

Source: Statistics Korea (2016b)

Table 4. Employment Ratio by Period

Classification	Employment Farms	Less than 1 month	1-3 months	3- 6 months	Over 6 months
2010	27.4%	20.4%	5.0%	1.1%	1.2%
2011	39.2%	33.2%	4.5%	0.7%	1.0%
2012	39.3%	33.3%	4.4%	0.8%	1.0%
2013	35.6%	29.7%	4.3%	0.7%	0.9%
2014	34.1%	28.4%	3.9%	0.7%	0.9%
2015	23.0%	16.2%	4.5%	1.1%	1.3%

Source: Statistics Korea (2016b)

Table 5. Proportions of Employment by Agricultural Types

Unit: %

Classification	2010		2011		2012		2013		2014		2015	
	a	b	a	b	a	b	a	b	a	b	a	b
Total	100.0	27.4	100.0	39.2	100.0	39.3	100.0	35.6	100.0	34.1	100.0	23.0
Rice	44.4	9.5	43.7	14.6	42.9	14.1	41.7	12.3	42.1	11.9	41.7	7.3
Food Crops	9.9	1.4	7.8	2.3	7.8	2.4	8.7	2.0	8.8	1.9	12.7	1.5
Vegetables	19.0	6.8	21.7	9.7	23.6	10.5	23.7	9.6	22.7	8.7	18.2	5.5
Special crops	3.0	0.9	3.2	1.3	3.0	1.3	3.1	1.2	3.6	1.3	4.5	1.0
Fruit	14.5	6.2	15.1	8.1	15.1	8.3	15.4	8.1	15.8	8.1	15.8	5.7
Flower	1.6	0.6	1.6	0.7	1.5	0.7	1.4	0.6	1.4	0.6	1.3	0.4
Other crops	0.8	0.2	1.1	0.5	0.6	0.2	0.5	0.2	0.4	0.1	0.9	0.3
Livestock	6.9	1.6	5.7	1.9	5.4	1.9	5.5	1.7	5.2	1.6	4.9	1.3

Note 1: a = proportions by agricultural forms, b= proportions of farms with employment

Note 2: Rice grown in rice fields

Note 3: Rice grown in fields, barley, corn, beans, red beans, potatoes, sweet potatoes, etc.

Source: Statistics Korea (2016b)

approximately 40% of the total farms are cultivating rice, which is the main staple diet and holds great importance in agriculture in South Korea. Therefore, rice farms show the highest tendencies in hiring laborers, followed by fruit farming, food crops, and livestock husbandry.

III. Analysis of Agricultural Employment Demand Determinant for Gangwon Farms

1. Data Source

This research uses the ‘2015 Agriculture Forestry and Fishery Census’ source data, which includes complete enumeration on farms from the National Statistics Office. This census is an officially designated statistical source (No.10141) as specified by “Statistics Act Article 17 Section 1”. This investigation is the basic national census that serves as the basis of diversified agriculture and fishery related policies. In 2015, an investigation occurred on 1.0885 million farms located within 16 local government jurisdictions, including Seoul, six metropolitan cities, and nine provinces. In Gangwon under the 2015 census, there were 73,000 farms, making up 6.7% of the

total farm count. Farms without cultivating acreage or agricultural income were excluded in the study, and 63,182 farms and their owners were targeted to examine agricultural employment conditions. The Farm Household Economy Survey states that the definition of a farm is as follows. A farm refers to a household under direct cultivation of more than 10ha of field for living or for profit, generates sales value of over 1.2 Mill KRW from cultivated agricultural produce, or the value of owned livestock exceeds 1.2 Mil KRW at the time of investigation.

When examining the farming types of the target farms in Gangwon, 26.7% of the farms cultivate rice, and 26.2% consist of food crops. 25.1% of the farms grow vegetables, followed by 6.1% in livestock husbandry, and 4.7% in fruit orchards. Farms in Cheorwon cultivate rice in general, and Hwacheon has twice the number of vegetable farms than rice paddies. In Hongcheon’s case, food crop and vegetable farms make up the majority of farming types.

In 2015, farms that hired laborers in Gangwon made up 25.4% (16,025 farms). The remaining 74.6% (47,157 farms) managed the farms by way of a home-based work force. The Pyeongchang and Taebaek areas showed the highest levels of outside employment ratios when categorized by region. Of the farms located in the Pyeongchang region,

Table 6. Major Farming Types by Region in Gangwon

Unit: The number of farm

Classification	Rice	Food Crops	Vegetables	Special crops	Fruit	Flowers	Other Crops	Livestock	Total
Chuncheon	1,010	962	1,474	813	394	33	63	374	5,123
Wonju	2,965	1,450	883	706	495	58	27	317	6,901
Gangneung	2,027	1,686	1,144	646	365	49	22	207	6,146
Hongcheon	1,555	1,712	1,666	643	140	32	77	503	6,328
Hoengseong	1,284	1,097	1,098	465	108	23	71	732	4,878
Yeongwol	197	1,582	808	292	230	17	18	166	3,310
Pyeongchang	192	1,652	1,852	224	91	42	18	127	4,198
Jeongseon	129	1,502	1,148	83	106	4	7	104	3,083
Cheorwon	2,763	204	550	88	30	14	7	277	3,933
Hwacheon	314	307	659	465	46	7	28	137	1,963
Yanggu	654	196	692	140	79	16	27	139	1,943
Inje	462	971	854	273	63	17	31	110	2,781
Donghae	251	810	591	355	294	5	3	55	2,364
Goseong	1,189	175	210	292	48	5	4	99	2,022
Yangyang	1,035	375	328	465	176	13	2	147	2,541
Taebaek	2	108	393	24	24	3	2	41	597
Sokcho	261	221	174	78	51	0	7	35	827
Samcheok	602	1,540	1,355	198	216	7	23	303	4,244

Source: ‘2015 Census of Agriculture, Forestry and Fisheries’ raw data

75.3% employ workers on their farms, making Pyeongchang the region with the highest rate of farm employment.

When examining the agricultural labor force employment by period, 17% of farms hire workforce for under a one-month period. 5.0% of the farms hire a workforce between a one- to three-month period, and 2.0% of the farms hire a workforce between three- to six-month periods. Farms employing a workforce for over six months make up 2.0%. Therefore, the farms in Gangwon more often utilize a home-based workforce rather than external employment. Of the farms hiring an outside the workforce, the ratio of short-term employment is higher than mid- to long-term employment. Meanwhile, of farms hiring workers on a regular basis, those with more than three months of employment make up 3.6% (2,274 farms) in Gangwon in 2015. The majority of farms in the region hold short-term employment, which lasts three months. Cheorwon has the highest number of farms with employment over three months at 394 farms (17.3%) followed by Hwacheon and Hongcheon at 330 farms (14.5%) and 288 farms (12.7%), respectively. On average, the region with the highest domestic employment is Jeongseon, followed by Hwacheon and Yanggu. Additionally, the region with the highest

foreign employment on average for more than a three-month basis is Cheorwon.

As mentioned in the introduction, studies investigating regular employment determinants of both domestic and foreign workers are sparse. Therefore, this research has examined how an owner's demographical features influence the regular employment of domestic and foreign workers. Table 11 indicates the foundational statistics of socio-economic features on the subjects. The average cultivation acreage of the subjects is 1.39ha, and 25.0% of the total respondents hire laborers.

The average age of the subject farm owners is 64.06, with an average career of 30.9 years. Subject owners with a high level of education (high-school diploma or higher) make up 39.0% of the total. 81.0% of the total respondents were married, and average household size was 2.4 people per family. 66.0% of the farms own agricultural machinery, and 68.0% of the farms utilize informational technology. 53.0% of the subjects are professional farmers, and 25.0% of the farms are participating in an agricultural organization. 29.0% of the farms are agricultural businesses, and 31.0% of the farms participate in sales of major produce through an agricultural organization

Table 7. Distribution of Farms by Region in Gangwon

Unit: The number of farm

Region	Farms without Employment	Farms with Employment	Employment Farmer over 3 Months				
			Total	Korean employment		Foreign employment	
				Mean	Max.	Mean	Max.
Chuncheon	4,723	850	158	0.0503	9	0.0325	9
Wonju	5,688	1,213	89	0.0431	62	0.0107	10
Gangneung	4,420	1,726	111	0.0628	20	0.0065	10
Hongcheon	5,275	1,053	288	0.0821	44	0.0859	10
Hoengseong	3,922	956	145	0.0571	23	0.0600	10
Yeongwol	2,496	814	66	0.0773	12	0.0045	5
Pyeongchang	1,039	3,159	104	0.0907	16	0.0214	9
Jeongseon	1,912	1,171	112	0.2731	61	0.0081	5
Cheorwon	3,070	863	394	0.0907	71	0.1820	10
Hwacheon	1,430	533	330	0.2119	9	0.0596	6
Yanggu	1,289	654	121	0.2007	108	0.1307	18
Inje	2,174	607	155	0.1449	15	0.0920	10
Donghae	1,871	493	16	0.0228	10	0.0008	3
Goseong	1,684	338	46	0.0509	8	0.0118	8
Yangyang	3,420	121	14	0.0184	10	0.0015	3
Taebaek	281	316	21	0.0787	10	0.0134	4
Sokcho	682	145	22	0.0495	10	0.0012	3
Samcheok	3,231	1,013	82	0.0728	12	0.0030	7

Source: '2015 Census of Agriculture, Forestry and Fisheries' raw data

Table 8. Descriptive statistics for Variables Used in the Regressions

Variable	Unit	Mean	St. Dev.	Min.	Max.
Number of household members (Abbreviation: Family)	Person	2.40	1.14	1.00	9.00
Utilized agricultural land (Abbreviation: Land)	Hectare	1.39	2.44	0.00	141.90
Sales on agricultural produce (Abbreviation: Sales)	2015 Sales on Agricultural Produce	3.75	2.42	1.00	11.00
Participation in farmers' organization (Abbreviation: FOs)	Participation in farmers' organization = 1, otherwise = 0	0.25	0.43	0.00	1.00
Agricultural business management (Abbreviation: Agribusiness)	Agricultural business management = 1, otherwise = 0	0.29	0.45	0.00	1.00
Possession of machinery	Agricultural machinery farmers = 1, otherwise = 0	0.66	0.47	0.00	1.00
Farming career	Years	30.90	17.92	1.00	80.00
Gender	Man = 1, otherwise = 0	0.86	0.35	0.00	1.00
Age of Farm Manager	Years	64.06	10.73	22.00	96.00
Agricultural produce distributor	Farmers' organization = 1, otherwise = 0	0.31	0.46	0.00	1.00
Full-time farmer	full-time farmer = 1, otherwise = 0	0.53	0.50	0.00	1.00
Informational technology usage	Use information devices = 1, otherwise = 0	0.68	0.47	0.00	1.00
Education level of farmer	Over high school = 1, otherwise = 0	0.39	0.49	0.00	1.00
Marital Status	Married = 1, otherwise = 0	0.81	0.39	0.00	1.00
Farming type: Rice	Rice = 1, otherwise = 0	0.27	0.44	0.00	1.00
Farming type: Food Crops	Food Crops = 1, otherwise = 0	0.26	0.44	0.00	1.00
Farming type: Vegetables	Vegetables = 1, otherwise = 0	0.25	0.43	0.00	1.00
Farming type: Special crops, Mushrooms	Special crops, Mushroom = 1, otherwise = 0	0.10	0.30	0.00	1.00
Farming type: Fruit	Fruit = 1, otherwise = 0	0.05	0.21	0.00	1.00
Farming type: Flowers	Flower = 1, otherwise = 0	0.01	0.07	0.00	1.00
Farming type: Other crops	Other crops = 1, otherwise = 0	0.01	0.08	0.00	1.00
Farming type: Livestock	Livestock = 1, otherwise = 0	0.06	0.24	0.00	1.00

Note: KRW 1.2 Mil = 1, KRW 1.2 Mil - 3.0 Mil = 2, KRW 3.0 Mil - 5.0 Mil = 3, KRW 5.0 Mil - 10 Mil = 4, KRW 10 Mil - 20 Mil = 5, KRW 20 Mil - 30 Mil = 6, KRW 30 Mil - 50 Mil = 7, KRW 50 Mil - 100 Mil = 8, KRW 100 Mil - 200 Mil = 9, KRW 200 Mil - 500 Mil = 10, Over KRW 500 Mil = 11

Source: '2015 Census of Agriculture, Forestry and Fisheries' raw data

2. Methodology

This research uses the “2015 Agriculture Forestry and Fishery Census” as source data to analyze the determinants to employment selection. For this, the research used the Bivariate Probit Model, which can reflect the indigeneity of employment selection of domestic and foreign labor forces. The Bivariate Probit Model is adequate to examine non-observable and unnoticed correlations in the decision-making process (Jaenicke, 2009). Additionally, the Bivariate Probit Model allows for the correlation between disturbance factors, which may influence the outcomes of two different actions. This can reflect the dual selection in employment selection on both domestic and foreign workforces in the model. If farm i decides to conduct regular employment of domestic and foreign workforces, the choices of two actions that were unobserved can be represented as y_1^* and y_2^* . Equation (1) for the Bivariate Probit Model allows for a general correlation between the two choices provided.

$$\begin{aligned}
 y_1^* &= X_1\beta_1 + \epsilon_1 & (1) \\
 y_1 &= 1 \text{ if } y_1^* > 0, \quad y_1 = 0 \text{ otherwise} \\
 y_2^* &= X_2\beta_2 + \epsilon_2 \\
 y_2 &= 1 \text{ if } y_2^* > 0, \quad y_2 = 0 \text{ otherwise} \\
 \text{Here, } E[\epsilon_1|X_1, X_2] &= E[\epsilon_2|X_1, X_2] = 0, \\
 \text{Var}[\epsilon_1|X_1, X_2] &= \text{var}[\epsilon_2|X_1, X_2] = 1, \quad \text{Cov}[\epsilon_1, \epsilon_2 | X_1, X_2] = \rho
 \end{aligned}$$

Therefore, Equation (1) indicates the relationship between observable aspects (y_1, y_2) and unobservable aspects (y_1^*, y_2^*) when selecting domestic and foreign workforces in i farms. Error terms ϵ_1 and ϵ_2 are assumed to follow the bivariate normal distribution, and X_1, X_2 represent explanatory variable vectors in regular employment of domestic and foreign workforces. β_1, β_2 represent regression coefficient vectors. ρ in Equation (1) represents the correlation coefficient of covariance from the variance-covariance matrix. When error terms correlate to each other, this research assumed that covariance would hold a constant value (ρ).

If two error terms are independent, meaning the two estimations configured in Equation (1) can be interpreted to defy the bivariate normal distribution. In such case, a simple Probit model is better used for estimation.

Therefore, to prove that the selection of a workforce for the regular employment of domestic and foreign workers occurs simultaneously, $H_0: \rho = 0$ hypothesis must be tested.

Upon the denial of the above hypothesis, the Bivariate Probit Model will be proven more suitable for the analysis. When using bivariate normal distribution in such case, the equations for bivariate normal density function and joint probability density function are show in Equation (2) and Equation (3).

$$\begin{aligned}
 \Phi_2(x_1, x_2, \rho) &= \Pr(X_1 < x_1, X_2 < x_2) & (2) \\
 &= \int_{-\infty}^{x_2} \int_{-\infty}^{x_1} \phi_2(z_1, z_2, \rho) dz_1 dz_2 \\
 \phi_2(x_1, x_2, \rho) &= \frac{1}{2\pi\sqrt{1-\rho^2}} \exp\left[-\frac{1}{2}\left(\frac{x_1^2 + x_2^2 - 2\rho x_1 x_2}{1-\rho^2}\right)\right] & (3)
 \end{aligned}$$

Meanwhile when farm i selects domestic and foreign employment on a regular basis, subject y_1^* and y_2^* are not observed directly. Instead, binary responses (results) to the selection are “Yes” and “No”. In this case, ($y_1^*, y_2^* = (1, 1), (1, 0), (0, 1), (0, 0)$) may occur and its probability is as follows in Equation (4).

$$\begin{aligned}
 \Pr(y_1 = 1, y_2 = 0) &= \Phi(X_1\hat{\beta}_1) - \Phi_2(X_1\hat{\beta}_1, X_2\hat{\beta}_2, \rho) & (4) \\
 \Pr(y_1 = 1, y_2 = 1) &= \Phi_2(X_1\hat{\beta}_1, X_2\hat{\beta}_2, \rho) \\
 \Pr(y_1 = 0, y_2 = 1) &= \Phi(X_2\hat{\beta}_2) - \Phi_2(X_1\hat{\beta}_1, X_2\hat{\beta}_2, \rho) \\
 \Pr(y_1 = 0, y_2 = 0) &= 1 - \Phi(X_1\hat{\beta}_1) - \Phi(X_2\hat{\beta}_2) - \Phi_2(X_1\hat{\beta}_1, X_2\hat{\beta}_2, \rho)
 \end{aligned}$$

Through such a process, the regression coefficient of Equation (1) can be estimated through maximum likelihood estimation. For this, when representing $q_{i1} = 2y_{i1} - 1, q_{i2} = 2y_{i2} - 1$, with $y_{ij} = 1$ and $q_{ij} = 1, y_{ij} = 0$, and $q_{ij} = -1$ ($j = 1, 2$), $z_{ij} = X_{ij}\beta_j, w_{ij} = q_{ij}z_{ij}$. In this case, log-likelihood function is expressed through Equation (5).

$$\ln L = \sum_{i=1}^n \ln \Phi_2(w_{i1}, w_{i2}, \rho_{i*}) \quad (5)$$

Here, $\Pr(y_1 = y_{i1}, y_2 = y_{i2} | X_1, X_2) = \Phi_2(w_{i1}, w_{i2}, \rho_{i*})$

If the estimated coefficient value is the maximum likelihood estimator (MLE), estimated results through the Bivariate Probit model will indicate the direction of influence and statistical significance for each variable, but it does not signify the magnitude of influence. Therefore, calculating the marginal effects to signify the magnitude of the influence will be necessary. For the calculative convenience, when $X_1\beta_1 = X\gamma_1, X_2\beta_2 = X\gamma_2$ is used, a non-conditional average value when selecting each domestic and regular foreign employment is expressed by Equation (6).

$$E[y_j | X] = \Phi(X\gamma_j), \quad j = 1, 2 \quad (6)$$

When the conditional density function is symmetrical, the marginal effect in the Bivariate Probit Model will be

3. Results

Table 9 shows the analysis result of the determinant factors which influence the regular employment of a labor force on farms located in Gangwon using the Bivariate Probit Model. The likelihood ratio test results on value to show the correlation between the two choices to select the model indicates statistical significance at a 1% significance level. The model test results indicate that the regular employment of domestic and foreign labor force holds correlation through error terms. Therefore, the Bivariate Probit Model is better for use when compared to the Monovariate Probit Model. Additionally, ρ which signifies regular employment of domestic and foreign labor forces, holds positive values. This means that there is a positive correlation between the employments of the two labor forces.

Observing the factors that influence the regular employment of domestic workforce by regions, there were valid differences between regions in the Gangwon. Compared to Chuncheon, Gangneung, Hongcheon, Yeongwol, Jeongseon, Hwacheon, Goseong and Yangyang farms show a high probability of hiring domestic workforce under regular employment, while Taebaek, Samcheok, and

equal to the Univariate Probit Model. In this case, the expression of marginal effects of a specific explanatory variable is in Equation (7). This is obtained by partially differentiating Equation (6) into corresponding explanatory variables. Meanwhile, when both domestic and foreign workers are selected simultaneously, the conditional average value is expressed through Equation (8). In the above case, the marginal effect of single unit conversion in the independent variable is expressed through Equation (9).

$$\frac{\partial E[y_j | X]}{\partial X} = \phi(X\gamma_j)\gamma_j, \quad j = 1, 2 \quad (7)$$

$$E[y_1 | y_2 = 1, X] = \Pr(y_1 = 1 | y_2 = 1, X) = \frac{\Pr(y_1 = 1, y_2 = 1 | X)}{\Pr(y_2 = 1, X)} \\ = \Phi_2(X_1\gamma_1, X_2\gamma_2, \rho) \quad (8)$$

$$\frac{\partial E[y_1 | y_2 = 1, X]}{\partial X} = \left(\frac{1}{\Phi(X\gamma_2)} \right) [g_1\gamma_1 + (g_2 - \Phi_2 \frac{\phi(X\gamma_2)}{\Phi(X\gamma_2)})\gamma_2] \quad (9)$$

Yanggu which show a decreased probability to hire a domestic workforce. In other words, regions yielding highland vegetables, which include Taebaek, Samcheok, and Yanggu, show a reduced probability for hiring a domestic workforce for more than three months in comparison to Chuncheon which consists of urban farming.

When observing the regular employment of a foreign workforce in Gangwon by region, Donghae, Hoengseong, Yeongwol, Pyeongchang, and Jeongseon possess an increased probability of hiring foreign employees in comparison to Chuncheon. Meanwhile, farms in Wonju, Gangneung, Sokcho, Samcheok, Hongcheon, Inje and Goseong show a reduced probability of hiring foreign workforce under regular employment when compared to Chuncheon. In particular, farms in Samcheok show a decreased probability in both the domestic and foreign workforces under regular employment when compared to Chuncheon, while Yeongwol and Jeongseon farms show a higher probability of regular employment in both labor forces. When observing the determinants of regular employment by specific factors, farms participating in agricultural organization show an increased probability to hire both domestic and foreign labor forces when compared to farms that did not participate in the organization. However, farms focused on agriculture-related business

show a higher probability of hiring a domestic workforce under regular employment, but regarding the regular employment of foreign workforce, the probability tends to decrease when compared to those that do not conduct such business. Also, farm owners with higher education show a higher probability of hiring a domestic workforce on regular employment when compared to owners without a high educational level. However, if the owners' farming career gains success, the domestic workforce employment probability decreases.

As the age of the owner rises, the probability of hiring domestic and foreign workforces on a regular basis decreases, but from age 48.8, the domestic workforce employment probability tends to increase. In addition, the

domestic workforce employment increases as cultivation acreage increases, but from 64.08ha in size, domestic workforce employment tends to decrease. If the farm owners' gender is female, the probability of hiring a regular workforce decreases. Meanwhile, for agricultural distributors, the transaction made through agricultural organizations tends to have a higher probability of hiring a domestic workforce under regular employment. Therefore, acquiring a stable distribution channel poses positive influences to regular employment intentions. Future agricultural workforce policies should consider agricultural sales channels as well. Additionally, the higher the farm's sales income, the more the regular employment probability for both domestic and foreign workforces increases. When

Table 9. Results from the Binary Employment Decision

Dependent variable	Domestic Hire		Foreigner Hire		Dependent variable	Domestic Hire		Foreigner Hire	
	Estimate	Std. Error	Estimate	Std. Error		Estimate	Std. Error	Estimate	Std. Error
Wonju	-0.082	0.072	-0.309**	0.121	Agribusiness	0.093***	0.030	-0.029	0.046
Gangneung	0.179*	0.068	-0.629***	0.144	Education	0.133***	0.031	0.073	0.046
Donghae	-0.018	0.065	0.219***	0.079	Farming career	-0.005***	0.001	0.002	0.002
Taebaek	-0.294***	0.076	0.072	0.087	Use information devices	-0.009	0.030	0.150***	0.042
Sokcho	-0.055	0.077	-1.080***	0.181	Age	-0.020*	0.011	-0.032*	0.017
Samcheok	-0.205***	0.072	-0.828***	0.108	Age×Age	0.000*	0.000	0.000	0.000
Hongcheon	0.233***	0.072	-0.837***	0.150	Land	0.045***	0.005	0.003	0.007
Hoengseong	-0.099	0.071	0.880***	0.081	Land × Land	-0.000***	0.000	0.000	0.000
Yeongwol	1.236***	0.063	0.301***	0.101	Agricultural distributor	0.069*	0.030	-0.012	0.042
Pyeongchang	0.158	0.077	0.189**	0.096	Full-time farmer	0.032	0.028	0.043	0.042
Jeongseon	0.415***	0.072	0.492***	0.096	Marital Status	0.010	0.046	0.036	0.077
Cheorwon	-0.050	0.116	-0.629	0.417	Sales	0.219***	0.008	0.353***	0.014
Hwacheon	0.175*	0.090	-0.159	0.195	Farming type: Food Crops	0.151***	0.050	0.827***	0.104
Yanggu	-0.315**	0.123	-0.497	0.306	Farming type: Vegetables	0.322***	0.043	1.361***	0.079
Inje	-0.004	0.124	-1.227***	0.299	Farming type: Special Crops	0.355***	0.055	0.551***	0.113
Goseong	0.538***	0.111	-0.632	0.480	Farming type: Fruit	0.242***	0.067	0.573***	0.146
Yangyang	0.181**	0.074	-1.011***	0.186	Farming type: Flower	0.529***	0.123	1.205***	0.176
Family	-0.007	0.012	0.025	0.017	Farming type: Other crops	0.224	0.140	1.168***	0.181
Machinery possession	-0.036*	0.470	0.067	0.070	Farming type: Livestock	0.117**	0.056	0.459***	0.093
Gender	-0.239***	0.051	-0.163*	0.097	Constant	-3.044***	0.355	-4.691***	0.523
Participation in FOs	0.050*	0.029	0.340***	0.044					

Note : =0.270***.LRtestofrho=0:chi2(1)=89.2953,Prob>chi2=0.0000.Asterisks denote the following: * = <0. 1, ** = < 0.05 and ***= < 0.01

Source : Authors, based on 2015 Census data.

examining by farming types, rice farmers tend to have a higher probability of hiring an external labor force under regular employment as compared to other farming types. This closely relates to the distribution of farming machinery. However, when rice farms have constancy in other conditions, these farms show a higher probability of utilizing a home-based labor force rather than hiring an external labor force for farming.

The above analysis results indicate the influential direction and statistical significance per each variable, but the analysis itself does not signify the size of the influence. Therefore, observing the probability shifts through a single unit change in independent variable under constant conditions is necessary. Table 10 shows the estimated results of marginal effects focusing on the statistically valid variables. When examining the probabilities by region, the farms in Yeongwol had a 10.68% probability to hire a domestic workforce under constant variables, showing the highest probability rate in Gangwon, followed by Goseong at 2.26%, and Jeongseon at 1.46% when compared to Chuncheon. Farms in Hoengseong had a 0.16% probability to hire a foreign workforce under constant variables, showing the highest probability rate in the district, followed by Jeongseon at 0.04%, and Donghae at 0.01% when compared to Chuncheon. In particular, farms in Yeongwol show an increased probability in hiring both domestic and foreign workforces when compared to Chuncheon.

Farms participating in an agricultural organization show a 0.02% increase in foreign workforce employment probability when other variables are constant. The overall analysis indicates that regular employment probability for both the domestic and foreign workforces tends to increase. Meanwhile, for agricultural related businesses, the regular employment probability of the domestic workforce rises by 0.21%. This matches with the previous study by Yi (2016), indicating that farms with active non-farming income increase the regular employment of domestic workforce. Such agricultural related businesses contribute to generating jobs in rural areas. For agriculture related business, the regular employment probability of a domestic workforce increases by 0.21%, and the probability to utilize home-based workforce in agriculture related business decreases. This result matches with Yi (2016)'s research results which indicate active non-farming income increases

the regular employment of a domestic workforce, and such businesses contribute to generating jobs in rural areas.

When the owner's education level reaches higher levels of education, the regular employment probability of a domestic workforce rises by 0.3% when compared to lower levels of educations. Additionally, an insignificant increase in regular employment probability for both domestic and foreign workforce was detected. Farms using informational technology have increased the probability of hiring domestic and foreign workforces under regular employment when compared to farms that do not implement informational technology. As the age level of the owners rise, the probability of hiring a domestic workforce decreases by 0.04%, but from the threshold age level, regular employment of domestic workforce increases. Farms possessing higher cultivating acreage show an increased probability of 0.10% in regards to domestic workforce employment, and although insignificant, probabilities in both domestic and foreign workforce employment show an increase. When the farm is owned by a female farmer, the probability of utilizing a home-based workforce rises by 6.7% when compared to male farm owners. The regular employment probability of a domestic workforce decreases by 6.5%. When a farm makes its major sales through an agricultural organization, the probability for a domestic workforce under regular employment rises by 0.15%, and as the amount increases, the regular employment probability for a domestic workforce rises by 0.48%.

Examined by farming types, the probability of utilizing a home-based workforce decreases in other forms of farming when compared to rice farming, and the probability to hire a foreign workforce increases. Compared to rice farms, floriculture farms show an increased probability of 0.07% in both domestic and foreign workforce employment, and farms cultivating other food crops and vegetables show an increase of 0.03%~0.04% in regular employment probability for both domestic and foreign workforces. The regular employment probability of both domestic and foreign workforces in orchards and special/medicinal crop farms increases by 0.01%, and when compared to rice farms, livestock farms show an insignificant rise in the regular employment probability for both domestic and foreign workforces. Therefore, the farming type poses statistical significance for the intention of hiring domestic and foreign workforces under regular employment.

Table 10. Marginal Effect on Making Employment Decisions

Dependent variable	No employment		Domestic employment		Foreign employment		Domestic and foreign employment	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Wonju	0.0018	0.0014	-0.0016	0.0013	-0.0001***	0.0000	0.0000***	0.0000
Gangneung	-0.0047**	0.0022	0.0047**	0.0021	-0.0001***	0.0000	0.0000***	0.0000
Donghae	0.0003	0.0014	-0.0003	0.0014	0.0001*	0.0001	0.0000	0.0000
Taeback	0.0049***	0.0010	-0.0049***	0.0009	0.0000	0.0000	0.0000	0.0000
Sokcho	0.0013	0.0015	-0.0011	0.0015	-0.0001***	0.0000	0.0000***	0.0000
Samcheok	0.0038***	0.0011	-0.0037***	0.0010	-0.0001***	0.0000	0.0000***	0.0000
Hongcheon	-0.0066**	0.0026	0.0067***	0.0026	-0.0001***	0.0000	0.0000***	0.0000
Hoengseong	0.0004	0.0014	-0.0020	0.0012	0.0016***	0.0005	0.0001***	0.0000
Yeongwol	-0.1071***	0.0114	0.1068***	0.0114	0.0001	0.0001	0.0001**	0.0001
Pyeongchang	-0.0043*	0.0024	0.0042*	0.0024	0.0001	0.0001	0.0000	0.0000
Jeongseon	-0.0151***	0.0037	0.0146***	0.0037	0.0004**	0.0002	0.0001**	0.0000
Cheorwon	0.0011	0.0023	-0.0010	0.0023	-0.0001***	0.0000	0.0000***	0.0000
Hwacheon	-0.0047	0.0029	0.0047	0.0029	0.0000	0.0000	0.0000	0.0000
Yanggu	0.0051***	0.0013	-0.0050***	0.0013	-0.0001***	0.0000	0.0000***	0.0000
Inje	0.0002	0.0027	-0.0001	0.0027	-0.0001***	0.0000	0.0000***	0.0000
Goseong	-0.0226***	0.0076	0.0226***	0.0075	-0.0001***	0.0000	0.0000*	0.0000
Yangyang	-0.0048*	0.0024	0.0048***	0.0023	-0.0001***	0.0000	0.0000***	0.0000
Family	0.0001	0.0003	-0.0001	0.0002	0.0000	0.0000	0.0000	0.0000
Agricultural machinery	0.0004	0.0008	-0.0003	0.0008	0.0000	0.0000	0.0000	0.0000
Gender	0.0067***	0.0017	-0.0065***	0.0017	-0.0001	0.0001	0.0000*	0.0000
Participation in FOs	-0.0013*	0.0007	0.0011	0.0006	0.0002***	0.0001	0.0000***	0.0000
Agribusiness	-0.0022***	0.0007	0.0021***	0.0007	0.0000	0.0000	0.0000	0.0000
Education	-0.0031***	0.0008	0.0030***	0.0007	0.0000	0.0000	0.0000*	0.0000
Farming career	0.0001***	0.0000	-0.0001***	0.0000	0.0000	0.0000	0.0000	0.0000
Use information devices	0.0001	0.0007	-0.0001	0.0006	0.0001**	0.0000	0.0000**	0.0000
Age	0.0005*	0.0003	-0.0004*	0.0002	-0.0000*	0.0000	-0.0000*	0.0000
Age × Age	-0.0000**	0.0000	0.0001*	0.0000	0.0000	0.0000	0.0000	0.0000
Land	-0.0010	0.0010	0.0010***	0.0001	0.0000	0.0000	0.0000*	0.0000
Land × Land	0.0000***	0.0000	-0.0001***	0.0000	0.0000	0.0000	-0.0000	1.6900
Agricultural distributor	-0.0016**	0.0007	0.0015*	0.0007	0.0000	0.0000	0.0000	0.0000
Full-time farmer	-0.0007	0.0006	0.0007	0.0006	0.0000	0.0000	0.0000	0.0000
Marital Status	-0.0002	0.0010	0.0002	0.0010	0.0000	0.0000	0.0000	0.0000
Sales	-0.0050***	0.0002	0.0048***	0.0002	0.0001***	0.0000	0.0000***	0.0000
Farming type: Food Crops	-0.0044***	0.0014	0.0036***	0.0013	0.0008***	0.0003	0.0001***	0.0000
Farming type: Vegetables	-0.0117***	0.0016	0.0085***	0.0014	0.0029***	0.0007	0.0003***	0.0001
Farming type: Special Crops	-0.0117***	0.0024	0.0011***	0.0023	0.0004**	0.0002	0.0001**	0.0000
Farming type: Fruit	-0.0076***	0.0025	0.0070***	0.0024	0.0005*	0.0003	0.0001*	0.0000
Farming type: Flowers	-0.0269***	0.0089	0.0215***	0.0082	0.0046*	0.0025	0.0007*	0.0004
Farming type: Other crops	-0.0109*	0.0058	0.0061	0.0050	0.0044*	0.0024	0.0004*	0.0002
Farming type: Livestock	-0.0033**	0.0016	0.0029*	0.0015	0.0003**	0.0002	0.0000**	0.0000

Note : Standard errors appear in parentheses. Significance levels: * = 0.1, ** = 0.05, and *** = 0.01.

Source : Authors, based on 2015 Census data.

IV. Discussion and Conclusions

Korean agriculture entered into a super-aged society beginning in the 2000s. Such agricultural super aging and the depopulation of rural areas resulted in a decrease in the agricultural workforce, and weakened community functions. This accelerated the stagnation of agricultural productivity and the decadence of agricultural vitality, and increased workforce deficiencies, which is the foundation of the agricultural industry. Therefore, the farms are maximizing the implementation of a home-based workforce, but the lack of a workforce induced farms' dependency on an employed workforce and agricultural machinery. However, the mechanization rate in dry farming since 2013 has been 56.3%, which indicates that a large part of dry-field labor relies on an employed workforce. In such context, this research examined major policies related to the agricultural labor force in South Korea and its employment status, and conducted empirical analysis on the influential determinants of regular employment of workforce in subjected farms in Gangwon. In particular, in this research, the correlation between domestic and foreign employment has been considered to examine the political implications to acquire an agricultural workforce.

Firstly, because of the locational features of Gangwon, with its vast agricultural land and a small number of agriculture and fishery employees (this exempts metropolises and Jeju Island), the features of the agricultural workforce demands in farms must be apprehended to enable stable farming in the future. Based on this, prioritizing the acquirement of a labor force to engage in agricultural operations is necessary. The analytic result from this research suggests a positive correlation between domestic and foreign employment, meaning that the demand for domestic and foreign employment is complementary, and considering such a demand correlation in the agricultural labor force is advisable.

The agricultural workforce policies today classify two categories: period and workforce. These policies neglect the interdependence between domestic and foreign employment. Therefore, the future mid- to long-term establishment of agricultural workforce employment policies should reflect these workforce demands from the farms. However, because the conflicts and cultural differences between

domestic and foreign employees may decrease productivity in agricultural productivity, prioritizing the cognizance of cultural discrepancies between cultures amongst the hired employees and expanding farming education to establish cooperative network amongst domestic and foreign workforce must be considered.

Secondly, the regional demand in agricultural workforce within Gangwon is very different, and establishing workforce employment policies by considering local farming conditions is needed. Especially when comparing Chuncheon with typical urban farming characteristics, farms in other regions show an increase in employment demands on both domestic and foreign workforces when other variables are constant. However, the regular employment demands on domestic and foreign workforces are different by region, and workforce employment policies are based on the present conditions of regional agriculture within Gangwon. To achieve this, establishing "Gangwon Province Agricultural Employment Demand Platform (Tentative)" can be an alternative solution. Such an agricultural workforce demand platform may increase the efficiency when operated on a national scale, as proposed by Yi (2016). However to achieve this, developing district-based workforce demand platforms must be considered in advance.

Thirdly, the younger the farm owner, the more the agricultural workforce demand rises. In particular, the domestic workforce under regular employment shows high demand. Therefore, to enable the stable settlement of youth farming, a movement with high social interest, procuring domestic labor force is necessary. Also, establishing a network amongst the young farmers to establish a circulation system of workforce employment can also be an alternative, meaning that despite the high demand of the workforce under regular employment, the lack of interactive connectivity will pose difficulties in procuring an agricultural workforce. Therefore, young farmers must apprehend these issues in acquiring workforce and respond accordingly.

Meanwhile, farms participating in an agricultural organization and farms conducting sales to Nonghyup (agricultural cooperatives) and other agricultural organizations show an increase in workforce demands. Recent government policies prioritize organizational support over individual farms; the farms' participations in such

agricultural organizations are increasing. The analysis results of this research indicate an increase in employment demands for regular employment on farms participating in agricultural organizations and farms conducting transactions with organizations such as Nonghyup. However, the continuous increase in workforce labor eventually leads to a rise in managerial expenses upon the increase of workforce demands. Therefore, the government's expansion policy to foster agricultural competitiveness must take these workforce demands of organization-participating farms into consideration.

The farming households in rural areas are suffering from both a lack of workforce and a rise in labor costs, inducing a 'doubled torment.' Recently, the employment demands for more than a three-month period is on the rise. Such mid- to long-term workforce demand issues are limited in resolution by independent entities. Therefore, the establishment of comprehensive workforce demand platform is necessary. As such, by acquiring a workforce through its region and farms will enable stable engagement in employment. However, the research focuses on suggesting political implications to acquire regular agricultural workforce and samples Gangwon. This means that generalizing the result may generate errors. Expanding the sample region will solve this issue, and this task is to be tackled by future studies.

주1) Under the Act on Foreign Workers' Employment, Etc., persons with Non-professional Employment (E-9) or Working Visit (H-2) status are eligible for employment in the Republic of Korea for three years. In addition, persons in Non-professional Employment (E-9) visa category may be reemployed at least six months after their departure from the country (<http://www.easylaw.go.kr>).

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References

1. Jaenicke, J. (2009) Detecting Social Interactions in Bivariate Probit Models, *Statistical Journal* 7(1): 67-85.
 2. Jang, M. G., Lee, J. H. (2011) The Study on the Agricultural Labor Supporting System of Marketing Organization and the Case Analysis in Japan and Korea, *Korean Journal of Food Marketing Economics* 28(4): 109-128.
 3. Kim, J. S. (2015) Hired Farm Labor and Policy Direction on Agricultural Labor Markets, *Journal of Agricultural Extension & Community Development* 22(2): 145-158.
 4. Lee, Y. D. (1999) A Study on the Utilization Method of Foreign Workers in Agriculture and Forestry Fields in Korea, *Korea Research Institute for Vocational Education & Training* 31(1): 97-112.
 5. Ministry of Employment and Labor(2017) Foreigners Employment Trend under the EPS.
 6. Oh, S. H. (2011), Research Trend in Urban-to-Rural Migration: Focusing on Korean Literature from 1996 to 2010, *Journal of the Korean Urban Geographical Society* 14(2): 77-90.
 7. Shin, H. H., Cho, G. D., Seo, J. S., Kim, I. S. (2013) The Relationship Between Aging of farmers and Hired Labors: an Analysis using the 2010 Census of Agriculture, Forestry and Fisheries Data, *Korea Agricultural Economics Association* 54(4): 149-175.
 8. Statistics Korea (2016a) 2015 Census of Agriculture, Forestry and Fisheries.
 9. Statistics Korea (2016b) Farm and Fishery Household Economy Survey in 2015.
 10. Yi, H. M. (2016) A Study on Determinants of 'Employment' : Focused on 6th industrialization, *Korean Journal of Food Marketing Economics* 33(3): 109-133.
 11. <http://kosis.kr>
 12. <http://www.easylaw.go.kr>
 13. <https://www.eps.go.kr>
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