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Analysis of Priorities of the 6th Industrialization Policies for Agriculture through AHP

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ABSTRACT : The purpose of this paper is to decide priorities of policy-objectives and support measures related to the 6th industrialization of agriculture, and prepare policy-objectives and alternatives to contribute to maintaining and promoting the community through creation of more jobs and added value. We used the Analytic Hierarchy Process (AHP) to reflect the experts' opinions about objectives, means and priorities of the 6th industrialization of agriculture. The important objectives of the 6th industrialization of agriculture were to create jobs, to increase added values, and to maintain and activate the community. The results showed that the most important objectives for the 6th industrialization of agriculture were maintaining and activating the community, expanding added values and creating employment in order. Policy means to achieve these objectives were financial support, human resource training & consulting, research & development, and marketing. The decision-makers determined marketing as the most important among the policy means to achieve the objectives of the 6th industrialization.

Key words : 6th Industrialization of Agriculture, Analytic Hierarchy Process (AHP)

1. Introduction

Free trade agreements are making a rapid progress in order to pull the growth of Korea's economy. Free trade agreements have a significant effect on Korea's agriculture. Nations with a small-scale agricultural structure in management and distributed land for cultivation face a growing volume of imported agricultural products from other countries to drop prices of domestic agricultural products and thus to reduce farmer's income. This is common in northeast Asian countries which include Korea, Japan and China with a small-scale and distributed structure in agriculture(Kim&Heo, 2011).

First, a policy is needed to improve the small-scale and distributed structure in agriculture for enhanced competitiveness in a long term in order to cope with this issue. Second, a management policy is needed for appropriately managing risks to stabilize management through commercial agriculture in a short term. That is, multidimensional management enables creation of added values and risk management by introducing processing sectors or sales sectors based on agricultural production(Kim et al. (1), 2014).

The aging farmer population is one of important factors which slow agricultural growth. If globalization is an external factor for agriculture, the aging farmer population is an internal factor. The aging rate of 'farm population' is 20.9% in 2010, which is faster than urban areas by 20 years. Furthermore, the aging rate of 'farm population' is predicted to be 35.6% in 2012, and 43.5% in 2022(Kim et al. (2), 2014).. The aging population is now common in agriculture or rural areas.

The aging farmer population needs two aspects of action to cope with it. One is to secure successors or farming populations. At the same time, it is needed to create jobs for aged farmers or women who are not physically strong. The other aspect is growing demands for social welfare services led by the aging farmer population. It is needed to address challenges in rural living, and to further provide caregiving or medical services. It is essential to establish a

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system for rapid resolution of this issue.

The aforementioned aging farmer population or changing lifestyle contributes to fast-changing food consumption patterns. In particular, more people dine out to consume food out of their home. Another fast-growing pattern is to buy processed side dishes to consume them at home. There is another growing demand for food supply delivered home or facilities by aging populations and the growing number of single-person households.

Such a changing consumption pattern suggests creation of a new market. In relation to this market, food serving or delivery is a new emerging market. A new business can be created from treating wasted agricultural products or food waste which occur in processing or eating food to recycle them as composts. Rural areas can internally address the demand to vitalize themselves.

People who live in urban areas are very interested in agriculture. According to the data from the Statistics Korea, the number of returners to rural areas to become a farmer is increasing as 4,067 households in 2010, 10,503 households in 2011, 27,008 households in 2012 and 32,424 households in 2013.

The number of small vegetable gardeners in urban areas is 150 thousand people in 2010 (104 ha) and 770 thousand people in 2012 (558 ha), and they grow vegetables for farming experiences or producing vegetables for their own consumption.

As urban dwellers' interest or participation in agriculture grows, a new opportunity is exchange between urban and rural areas, and expanded direct transactions between them. An opportunity for promotion in agriculture and vitalized rural areas can be created by employing returners to rural areas in the agricultural sectors to encourage exchange between rural areas and urban areas or direct transactions through the 6th Industrialization.

As described above, the smaller number of jobs and reduced income due to globalization and aging farmer population contributes to accelerating depression in agriculture. A new strategy is thus needed to meet social needs from the agricultural sector in order to invert the current situation.

Production in the narrow sense has just been emphasized in agriculture. Agriculture, however, can create new values in connection with development of various processed products to cope with changing consumer's food consumption patterns, or the dine-out industry, tourism and exchange, from the perspective of business(MAFRA, 2014).

The 6th Industrialization in agriculture is a strategy for integrating production with processing and sale, and forming a business eco-system which includes tourism or exchange to create jobs and added values in the relevant region(Kim, 2007; Kim, 2008). That is, producers including villages, crop units and agricultural production corporations as a leader use local resources, for example, agricultural, forestry and fishery products, byproducts, natural resources, scenery and culture in the relevant region to implement primary (production), secondary (processing) and tertiary (sale) industry, or to connect agriculture with manufacturing and retail businesses in the relevant region(Imamura, 1998; Kim, 2008; Kim&Heo, 2011; Kim, et al 2014).. This process aims to recover communities and to create values of the region.

Food production business, food distribution business, dine-out business and tourism which are connected with agriculture or rural areas are growing its volume. These industries have been included in the domain of manufacturing or service businesses in urban areas to drain added values from agriculture to the domain outside of agriculture(Kim, et al.(1) 2013; Kim, et al.(2) 2013). The 6th Industrialization in agriculture attempts to internalize jobs and added values related to the food industry, tourism and service business which have gone out of agriculture(RDA, 2014). It is a strategy for promoting agriculture or vitalizing rural districts through the aforementioned activities. An exemplary 6th Industrialization includes 'B to B' in which the other party of transactions is food manufacturing business or retail business, and 'B to C' in which the other party of transactions is consumers(Kim&Heo, 2011; Seo, 2013).

It has emerged as an important task to determine priorities of various policies and support projects related to the 6th industrialization of agriculture, which has been highlighted as an important agricultural policy, and execute highly effective projects. In rural areas, instability of the agricultural management following depopulation, aging of the population and liberalization of the agricultural market has become serious.

Increased instability of the agricultural management and aging of the population resulted in reduced vitality of the

region and a radical decease in the population. Therefore, it is necessary for the government to establish policy supports and measures to promote the local economy and to maintain and develop the community.

As for 6th industrialization of agriculture, Kim and Heo(2011) explored trends of Japan and China with respect to the 6th industrialization of agriculture and suggested effects as well as development directions through domestic cases in early stage and further offering development probability and conditions as CB. The foundation of the sixth industry requires unionization by village according to residents' accord. With this, reduction in production costs is possible in the price falling stage of agricultural products. Next, expand employment opportunity by introducing agricultural items, such as vegetable and flowering plant that require simple labor and expands business areas through development of specialty, direct trading, mutual exchange, and tourism, including processed goods using agriculture resources and further create higher value-added businesses.

Kim, et al.(2) (2014) found ways to vitalize rural areas through the 6th industrialization of agriculture. The 6th industrialization policy can mean a policy to increase agriculture's value added through the 6th industrialization, which is the convergence activity based on win-win cooperation, thus raising farm income. Also, this policy can be a policy to vitalize the rural industry by expanding the innovative 6th industrialization activity.

Previous studies did not deal with priorities of the 6th industrialization policies of agriculture. Therefore, the purpose of this analysis is to decide priorities of policy-objectives and support measures related to the 6th industrialization of agriculture, and prepare policy-objectives and alternatives to contribute to maintaining and promoting the community through creation of more jobs and added value. Specifically, this study will focus on determining objectives of the 6th industrialization of agriculture and determining priorities of the means of support required to achieve the objectives.

2. Data and Results

2.1. Method

When you want to select one of several decision alternatives according to various criteria, Analytic Hierarchy Process (Analytic Hierarchy Process: AHP) refers to a technique that will help decision-makers to present the ranking of each alternative to be selected for the most important alternative. Unlike the programming object hierarchy analysis to provide a variable amount of the crystal it is characterized by presenting a priority. It has been widely used in social sciences since Thomas Saaty suggested it in early 1970.

AHP analysis is to obtain a matrix through the pair comparisons between alternative choice. It can finally provide an alternative to the priority through deriving a weight for an alternative cross-reference. Decision-makers use the consistency index[1)] to validate consistent expresses that they suggest. AHP is the decision-making method that be divided by the whole process of decision-making, solve the problems in a number of steps and reach at the final decision.

2.2. Survey Design

Experts and representatives of local governments, who were related to the 6th industrialization of agriculture, were surveyed. In particular, as the 6th industrialization policy had been promoted independently by the local government, ahead of the central government policy, the experts included in the survey were selected from representatives of the local development research institutions. The survey was conducted through e-mails. 18 questionnaires were used for analysis.

2.3. Composition of the Questionnaire

This survey was designed using Analytic Hierarchy Process (AHP) in order to comprehensively reflect the experts' opinions about objectives, means and priorities of the 6th industrialization of agriculture. It had a 3-step structure to evaluate the objectives, means and relative importance of related projects of the 6th industrialization. Eighteen collected questionnaires were used in the analysis. Priority weights for the objectives were derived using pair comparison matrix and standard matrix. Priorities of means of each objective were determined through generalization and the priority of each means was determined ultimately. In this study, due to the diversity of projects related to

each policy measures, the generalization index between objective and project lacked the consistency among the respondents and therefore only the priority weight for simple project means was used.

In order to put together values given by the evaluators, the numerical integration method was used. Specifically, the standard matrix was obtained for each element of the pair comparison matrix prepared by the evaluator, and the evaluation values of all evaluators were integrated and generated using geometric mean value method.

The most important objectives of the 6th industrialization were to create jobs, to increase added values, and to maintain and activate the community. As for the policy measures to achieve these objectives, there were financial support, training & consulting, research and development, and marketing. The decision-maker was to determine the priorities of policy measures to achieve the important objectives of the 6th industrialization.

2.4. Analysis Results

2.4.1. Determination of Standard for Objectives

The important objectives of the 6th industrialization of agriculture were to create jobs, to increase added values, and to maintain and activate the community. Priority weights were obtained through the pair comparison matrix and the standard matrix for the objectives of the 6th industrialization. Experts in the related fields determined maintaining and activating the community as the most important objective of the 6th industrialization of agriculture, followed by expanding added values and creating jobs. In other words, the highest priority in achieving the objectives of the 6th industrialization was to maintain the communities.

2.4.2. Determination of Standard for Means

The 2nd stage analysis process was to determine priorities of the policy means related to the important objectives of the 6th industrialization, which were creation of jobs, increase of added values and maintenance of community. Major policy measures were financial support, training & consulting support, research & development support, and marketing support.

It was shown that, among the policy means related to job creation, marketing had the highest priority weight, followed by training & consulting support and financial support in order. The reason why the marketing means was determined as the most important decision-making standard for the objective of creating jobs in the community was because it was directly related to securing the sustainability of the 6th industrialization operators. Sustainable management of the related companies would eventually create new jobs.

Table 1. Overview of the Evaluation Standard for Objectives

Objective	Description
To create jobs	To create jobs for the participants, including local residents, through the 6th industrialization of agriculture
To increase added values	To create income by increasing added values of agriculture
To maintain the community	To maintain the community that has been depopulated and aged, through returning to farming

Table 2. Priority Weight for Each Objective

	Standard Matrix			Weight
	Jobs	Added Values	Community	
Jobs	0.0833	0.0588	0.0968	0.0796
Added Values	0.3333	0.2353	0.2258	0.2648
Community	0.5833	0.7059	0.6774	0.6555

Note: CR=0.0280

The highest priority of the policy means required for increasing added values was given to marketing support, followed by research & development and financial support in order. Important policy measures to ensure that the 6th industrialization operators achieve the objective of increasing added values include brand development, store opening support, and other marketing support including PR and market development.

Among the policy means related to maintain the community, training & consulting support had the highest

Table 3. Overview of the Means

Means	Description
Financial Support	Supporting funds and taxes for operating, maintaining and repairing the facilities
Training & Consulting Support	Training the residents, leaders and professionals, supporting the founding of new business and management improvement consulting
Research & Development Support	Supporting product development, sanitation and safety facilities, and local resource development
Marketing Support	Supporting brand development, store opening, PR, export and product markets

Table 4. Priority Weight of Policy Measures (based on New Jobs)

Policy Means	Standard Matrix				Weight
	Financial Support	Training & Consulting	Research & Development	Marketing	
Financial Support	0.0704	0.0225	0.2778	0.0996	0.1176
Training & Consulting	0.4225	0.1348	0.2222	0.1162	0.2239
Research & Development	0.0141	0.0337	0.0556	0.0871	0.0476
Marketing	0.4930	0.8090	0.4444	0.6971	0.6109

Note: CR=0.0276

Table 5. Priority Weight of Policy Measures (based on Added Values)

	Standard Matrix				Weight
	Financial Support	Training & Consulting	Research & Development	Marketing	
Financial Support	0.1379	0.2222	0.0458	0.4038	0.2025
Training & Consulting	0.0345	0.0556	0.0382	0.0577	0.0465
Research & Development	0.6897	0.3333	0.2290	0.1346	0.3467
Marketing	0.1379	0.3889	0.6870	0.4038	0.4044

Note: CR=0.0261

Table 6. Priority Weight of Policy Measures (based on Community)

	Standard Matrix				Weight
	Financial Support	Training & Consulting	Research & Development	Marketing	
Financial Support	0.1154	0.0941	0.2000	0.3600	0.2500
Training & Consulting	0.8077	0.6588	0.5333	0.4800	0.2692
Research & Development	0.0385	0.0824	0.0667	0.0400	0.0938
Marketing	0.0385	0.1647	0.2000	0.1200	0.1308

Note: CR=0.0657

weight, which included training of the residents and leaders, followed by financial support and marketing. In order to maintain and activate the community, consulting support for growth of the related companies was also considered as an important task in addition to training of the leaders.

2.4.3. Summing up the Priorities of Policy Objectives and Means

In determining priorities of the objectives to be achieved through the 6th industrialization and those of the policy means to achieve the objectives, the experts judged marketing to be the most important policy means, followed by financial support, training & consulting, and research & development in order.

The most important policy means to achieve various objectives of the 6th industrialization is support for marketing. The 6th industrialization of agriculture is in the process of maintaining and activating the community through expansion of added values and employment by reorganizing various projects, which have been carried out through the existing policies and measures, centering on the community and the primary industry.

Therefore, support of the central and local governments is required, which takes into consideration each community's different 6th industrialization level, rather than applying the existing uniform and inflexible support means and process. It is necessary to set the scope of policy objectives and means within a big frame and prepare a support system to implement actual support process more flexibly.

Among the policy means, the financial support covers various projects such as operation funds, facility funds, taxation, business founding funds and technology guarantee, and the operation funds and the facility funds are the most important ones. With regard to the training & consulting support, training for strengthening the residents' capacity and training of the employees of the 6th industrialization operators are the most important standards. For the research & development support, it is most important to support the

Table 7. Priorities of Objectives and Means (Sum-up)

	Employment	Added Values	Community	Total Score (Priority)
Financial Support	0.1176	0.2025	0.2500	0.2269
Training & Consulting	0.2239	0.0465	0.2692	0.2066
Research & Development	0.0476	0.3467	0.0938	0.1571
Marketing	0.6109	0.4044	0.1308	0.2415

Table 8. Priority Weights of Policy Means

	Operation Funds	Facility Funds	Taxation	Business Founding Fund	Technology Guarantee
Financial Support	0.2393	0.5761	0.0735	0.0530	0.0582
	Resident Training	Professional	Participants	Business Founding Support	Management Improvement
Training & Consulting	0.5359	0.1091	0.2559	0.0479	0.0511
	New Product	New Technology	Sanitation and Safety	Academic-Industrial Cooperation	Resource Development
Research and Development Support	0.0385	0.1039	0.5754	0.1828	0.0994
	Brand	Stores	PR	Market	Export
Marketing Support	0.0561	0.5207	0.1039	0.2508	0.0685

sanitation and safety facilities and the academic-industrial cooperation development program and for the marketing support, supporting opening of new stores and markets is most important.

3. Summary and Implications

this paper is focusing on determining objectives of the 6th industrialization of agriculture and determining priorities of the means of support required to achieve the objectives. We surveyed experts and representatives of local governments, who were related to the 6th industrialization of agriculture through e-mails. This survey was designed using Analytic Hierarchy Process (AHP) in order to comprehensively reflect the experts' opinions about objectives, means and priorities of the 6th industrialization of agriculture. It had a 3-step structure to evaluate the objectives, means and relative importance of related projects of the 6th industrialization.

In determining priorities of the objectives to be achieved through the 6th industrialization and those of the policy means to achieve the objectives, the experts judged marketing to be the most important policy means, followed by financial support, training & consulting, and research & development in order. The most important policy means to achieve various objectives of the 6th industrialization is support for marketing. The 6th industrialization of agriculture is in the process of maintaining and activating the community through expansion of added values and employment by reorganizing various projects, which have been carried out through the existing policies and measures, centering on the community and the primary industry.

It was shown that the most important objectives for the 6th industrialization of agriculture were maintaining and activating the community, expanding added values and creating employment in order. Policy means to achieve these objectives were financial support, human resource training & consulting, research & development, and marketing. The decision-makers determined marketing as the most important among the policy means to achieve the objectives of the 6th industrialization.

In order to maintain the community, expand added values, and create new employment, the policy support for marketing of the companies related to the 6th industrialization should be given the priority. The most important key to the 6th industrialization of agriculture is to secure the management stability of relatively small-scale community-based companies.

Therefore, the policy support that takes into consideration the level of each region and the capacity of each 6th industrialization operator is needed. The central government and local governments should establish a support system that sets the scope of policy objectives and means within a big frame and applies the actual support process more flexibly. This should be accompanied by projects that can build up the capacity of residents and experts.

주1) The degree of consistency can be obtained through the Consistency Index(CI) and Consistency Ratio(CR). n is the number of decision alternatives at $CI=(\lambda_{max}-n)/(n-1)$. RI means the Random Index at $CR=(CI/RI)\times 100\%$. If the ratio is generally less than 10% consistency, the pair-wise comparison matrix is considered to be inconsistent.

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References

1. Imamura Nakamura. 1998. "Comprehensive Industrialization Strategies for the Agriculture Sector through 6th industrialization of Agriculture". "6th Industrialization of agriculture for the Rigional Vitality. 21 century Village Development School.
2. Kim, Yong-lyoul, et al.(1). 2014. A Study on the Development Strategies of the 6th Industry of Agriculture by Anaylzing Rural Industrial Statistcs. Korea Rural Economic Institute.
3. Kim, Yong-lyoul, et al.(2). 2014. 6th Industrialization and Policies of Agriculture in Korea. The 6th Industrialization of Agriculture, 10th Anniversary FANEA Symposium. Korea Rural Economic Institute.
4. Kim, Tae-gon. 2007.11. A Comparative Study between Korea and Japan on Endogenous Rural

Vitalization Policy(3/3). Korea Rural Economic Institute.
5. Kim, Tae-gon. 2008. The 6th Industrialization Strategy of Agriculture for Rural Revitalization. Korea Rural Community Corporation.
6. Kim, Tae-gon and Heo Joo-Nyung. 2011. Creation of Value-added Farming in line with the Sixth Industry. Korea Rural Economic Institute.
7. Kim, Tae-gon, et al. 2012. Community Business Development Plan(2/3). Korea Rural Economic Institute.
8. Kim, Tae-gon, et al(1). 2013. Promotion Strategy for Community Business (Year 3 of 3). Korea Rural Economic Institute.
9. Kim, Tae-gon, et al(2). 2013. Start-up and Definition of 6th industrialization of Agriculture. Focus of Agricultural Policy, 69th. Korea Rural Economic Institute.
10. Ministry of Agriculture, Food and Rural Affairs (MAFRA). 2014. The Creative Aspects of Rural and Agriculture: Best practices of 6th industrialization.
11. Rural Development Administration(RDA). 2014. The 6th Industrialization Story to Show the Creative Economy of Rural and Agriculture.
12. Seo, Yoon-Jeung. 2013. The 6th Industrialization: Convergence Revolution. HNCOM.

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