This book is a collection of summaries of KREI reports. For more information, visit our website at www.krei.re.kr/eng/index.do.
2018
KREI
Research Summaries
The Korea Rural Economic Institute (KREI) is a national policy research institution in the fields of agriculture, rural areas, and the food industry. We continuously make efforts to respond to the uncertainty of Korea’s agrifood industry and develop farming and farm villages through new growth engines. Last year, KREI conducted various research projects with the following goals: foster farming and farming villages to respond proactively to the change of the times; come up with new growth engines in agriculture; strengthen agrifood safety and stabilize management of agrifood business; increase the quality of rural life and revitalize rural communities; and deal with the changes of trade conditions and improve international agricultural cooperation.

This book included the key findings of 28 basic and general research reports published in 2018. The research results were summarized so that many people can read them easily. If you would like to know more about the results or share opinions with the researchers, you can contact them using the contact information in the summaries. You can also search for relevant reports and download the full texts on the KREI website.

I would like to thank the related organizations that provided much guidance and advice during the research process, farmers who actively cooperated with our surveys, and the researchers who did their best under difficult circumstances. I hope that this collection of summaries will be useful in understanding major research findings within the 2018 KREI publications as well as current issues in agriculture and rural communities.

April 2019

Kim Chang-gil
President, Korea Rural Economic Institute
Vision
A global agricultural policy research institute which leads the sustainable future of agriculture and rural communities

Motto
- Broad Vision
- Profound Research
- High Self-Esteem

Mission
- Conduct surveys and research on mid- and long-term plans and policy measures for the economy of agriculture and forestry
- Conduct surveys and research on short-term policies for agriculture and forestry
- Conduct surveys and research on agro-food policies
- Conduct research on welfare promotion of rural residents and rural social problems
- Conduct research on international cooperation in the field of agriculture
- Conduct research on market supply and demand and mid- and long-term outlook for agricultural produce by item through monitoring
- Conduct surveys and research to promote public understanding of government policies on agriculture and forestry and conduct public opinion surveys and PR activities
- Conduct research jointly with research institutes at home and abroad
- Conduct research projects commissioned by the government, public institutions, and private organizations at home and abroad
- Conduct commissioned training for employees of the government and related organizations
Strategies

- Support government projects and establish a policy research system for leading agricultural policy
- Enhance the practicality of research outcomes
- Become a hub of agricultural policy research in Northeast Asia by strengthening global networking
- Innovate the research environment and organizational culture

History

- **September 1967** | The Agricultural Research Institute (ARI) was established at the Rural Development Administration
- **November 1973** | ARI was restructured to become the National Agricultural Economic Research Institute (NAERI) of the Ministry of Agriculture and Fisheries
- **April 1978** | The Korea Rural Economic Institute was established as a non-profit institution
- **September 1995** | The Agricultural R&D Promotion Center (ARPC) was established as an affiliate
- **January 1999** | KREI became a research arm of the Prime Minister’s Office in accordance with “The Act on the Establishment, Operation and Fostering of Government-Funded Research Institutions”
- **April 2005** | The Center for Rural Information & Culture (CRIC) was established as an affiliate
- **October 2007** | The KREI Beijing Office was opened
- **September 2009** | ARPC became an independent organization, the Korea Institute of Planning and Evaluation for Technology in Food, Agriculture, Forestry and Fisheries
- **May 2012** | CRIC became an independent organization, the Korea Agency of Education, Promotion and Information Service in Food, Agriculture, Forestry and Fisheries
- **August 2015** | KREI relocated to Gwangju-Jeonnam Joint Innovative City
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Administrative Staff : 63
Total : 196 (as of April 2019)
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A Study on Establishing the National Food Plan in Korea

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Background & Purpose of Research

In order to address various agrifood related problems arising in the entire food system, policy initiatives to seek policy liaison and cooperation among related parties and stakeholders, expand the public intervention of the government from the viewpoint of distribution and welfares, and ensure the sustainability of individuals and food systems in general and that of the state through economic, social and environmental balance and harmony, have been implemented through the establishment and promotion of national food plans around the world.

Based on the recognition of the need for a comprehensive national food strategy along with the establishment of a new government, the Korean government has discussed including the establishment of “a national food plan” in national tasks, with the Ministry of Agriculture, Food and Rural Affairs at its center. Until recently, however, the discussion on the national food plan has been focused mainly on its contents.

There has not been any specific discussion on how to establish a national food plan, which will serve as a strategic framework in the current policy environment where a number of central administrative agencies are segmentally implementing policies on agrifood. In addition, no proper laws, organizations, or related procedures have been prepared to ensure systematic establishment and continuous implementation of a national food plan.
This study examines the current state and related concepts of national food plans of Korea and of foreign countries, the existing policies on agrifood policies, and the current condition of the government’s implementation of policy plans for the agrifood sector, so as to propose national food plans in terms of plan structure, procedure and system which need to be taken into consideration when establishing a national food plan for the agrifood sector. Also, the purpose of this research is to identify tasks required to be carried out in order to secure the effectiveness of the national food plans once they are established.

**Research Methods**

A survey on the current status of domestic food plans and the status of implementation of government policies on the agrifood sector and related policy plans was conducted through data collection and review, survey through visitation to related institutions and agencies, and interviews with policymakers.

Experts were commissioned to write articles on reviewing the laws and regulations related to agrifood products and draw implications for preparation of legal foundations for establishing and implementing national food plans.

Related literature and data were collected and reviewed for the survey on actual condition of national food plans of major foreign countries, and experts were commissioned to write articles for more specific understanding of their national food plans.

A questionnaire survey was conducted on 600 consumers and 150 producers in the agricultural/livestock industry in order to ensure the systematic establishment and effectiveness of national food plans. Another questionnaire survey was conducted on 84 experts and in-depth interviews with local government policymakers were also conducted.

**Research Results and Implications**

A 10-year cycle is appropriate for the national food plan, for which supplementary plans should reflect the results of assessment and evaluation in the 5th year after the
In order to establish the national food plan, it is necessary to take into consideration systematic and procedural maintenance and step-by-step expansion of the contents and scope of the plan. In that the national food plan needs to encompass various policy areas throughout the entire steps of the food system, it is necessary to establish the relationship among plans considering the compatibility of policies, and present the mid- and long-term direction and principles for the policies related to other governmental plans and the local governments’ food plans. It is necessary to prepare a legal ground to establish the national food plan. In the process of establishing the plan, procedural participation of the stakeholders in each stage should be ensured and their opinions should be collected and reflected. It is necessary to introduce a multi-level discussion structure, to normalize channels and procedures for participating in publicizing the issues related to the national food plan.

In order to ensure the effectiveness of the national food plan, it is necessary to establish governance that enables liaison and cooperation among ministries and agencies. Furthermore, a support organization needs to be established. Also, securing the effectiveness of the national food plan requires to regularly check and evaluate the process and performance of related policies. In order to promote the effective implementation of the national food plan and enhance its overall performance, the vision and goals of the plan need to be implemented stably and continuously in the regions where the government policies are actually implemented, through liaison with them. To this end, the basic vision and goals of the national food plan should be reflected in the local food plans depending on the regional conditions, and the supports from legal, procedural, or planning aspects should be provided as well as other incentives for participation like budget support. Acknowledgement and understanding of the food plan by stakeholders such as government policymakers, private organizations, and the general public should precede continuous and active implementation of the national food plan.
The Effects of Climate Change on Forest Insect Disturbance in South Korea: Challenges and Prospects

**Research Background**

The effects of climate change, such as drought and abnormal temperatures, are progressively becoming more of a reality. The change that climate change brought on the forest environments and emersion of pests call for a more delicate management measure. Therefore, it is necessary to reevaluate the current control method and establish a direction of a new preventive strategy considering the trend of climate change. For this effort, basic research should be conducted to objectively assess the damage and the potential economic threat of forest pests. In particular, it is very important to establish the damage rate (damage function) that reflects direct and indirect factors of forest pests.

The damage rate must be determined in order to measure the actual loss caused by the damage such as its effect on economics. The pest prediction model currently in use in Korea predicts the occurrence risk; however, it is limited as to measuring a definite damage rate and the economic ripple effect that it causes. Analyzing the damage and the economic impact of forest pests is crucial as it provides the basic information necessary to solve upcoming ecosystem disturbances and maintain healthy and productive forests. It can also serve as an objective foundation for policy-making to prevent other pest disasters caused by climate change and to help adapt to future climates.


Research Method

The target subjects of this study are the most common forest pests and the main damaged tree species in Korea. With the advice of experts in the field, the pine wilt disease and the oak wilt disease have been selected as the target pests - reflecting the increasing trend of deciduous forests. To measure the damages inflicted by pests, the structural damage function used in studies such as Cobourn et al. (2011) and Kim Yongjun et al. (2015) was implemented, and also the nonlinear panel probit model and the GEE estimation method were introduced. In addition, the mean per panel value was added to the model according to the method proposed by Mundlak (1978) and Chamberlain (1980) to reflect the fixed effect that has not been observed. The estimated damage function and RCP8.5 data were used to predict the future damage rate of pests caused by climate change. The damage rate of future pine tree wilt and oak wilt was predicted for the next 80 years from 2018 to 2100, and GIS was used to show the future damage rate by city/county areas.

In the assessment of the economic impact by the forests, the concept of environmental payout was introduced to take into account the economics of wood and non-wood materials. For the economic analysis, three scenarios were set up: no pest outbreak (baseline), pest infestation (no pest control), and pest infestation (prevention and control). And the earnings and the forest management revenues that included the wood and non-wood materials for each scenario were compared. Based on the results of the analysis, simulation was conducted to investigate the changes in forest management revenues such as changes in wood market prices, environmental payouts, climate change, and usage of infected trees.

Research Results and Implications

After the estimation of the damage function and prediction of the future damage rate, it was confirmed that the future damage owing to forest pests and the extent of the damage areas would increase due to climate change. In addition, the analysis of economic impacts showed that the increase of pest damage caused by climate change
would worsen forest management revenues and increase uncertainty. As pest damage brought on by climate change is expected to increase uncertainties and economic losses, there is a marked need to review the policies that have been focusing only on post-response tasks. In addition to proper post-incident management, it is necessary to stably control pests through the reinforcement of pre-incident management.

As a precautionary strengthening measure, identification of key management subjects, improvement of tree health, improvement of pest resistance through the development and replacement of species, and elimination of externalities through environmental payment were suggested. Until now, low forest management revenues have led to a lack of incentives for forest owners to focus on pest control, thus depending on the country to carry out pest control. However, if the pest increases due to climate change in the future, the current government-based management system may face a shortage of budget and workforce. Therefore, there is a need to encourage individual forest owners to actively manage pests through better profit caused by healthy forests.

In order to supplement the post-treatment measures, it is possible to immediately treat dead trees due to oak wilt disease; strengthen the prevention of artificial spreading of pine wilt disease; and expand the use of infected trees to enhance forest management profits.

The contributions of this study are that it establishes pest damage functions that consider various factors and evaluates the economic impact of pest insect considering management factors using dynamic analysis. Previous studies mostly used the static method such as partial equilibrium when they evaluate economic effects of the forest pests, and did not consider various management factors such as pest control which can possibly affect the real damage. However, in this study, the demographic variables used to assess anthropogenic activities have limitations in that they do not reveal a specific correlation between detailed history of activities and the damage rates. It is necessary to identify substitutional variables that can represent the details of future artificial activities and reflect them in the model. The relationship between the details for pest control, the efficiency of the pest control and the profitability of the forest management can be suggested as a future research topic.
Determinants and Strategies for Exports of Agri-Food Firms

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Background of Research

As a result of the proliferation of bilateral and plurilateral trade agreements, exports of agri-food have been expanding. Policy instruments have played an important role in improving export performance by adding value and jobs in the agri-food industry. However, in Korea, there have been few theoretical and empirical studies on the role of the agri-food exporters as the core of the new trade theory. The purpose of this study is to analyze the determinants of exports and the factors influencing export performance. Based on the results of this analysis, we investigated the effective strategies and policy implications to improve export performance for each type of agri-food firms. Therefore, the importance of this study is that it empirically explores the strategies of each type of agri-food firms and decision making for exports, as well as the survival in export markets and export performance.

Method of Research

For the analysis, we used the literature review, statistical analysis, econometric analysis, survey, interviews and expert consultation. We examined the status of the agri-food industry and firms and reviewed the theoretical and empirical backgrounds on the determinants of export status and export performance. Statistical data were collected
from various sources and used for the analysis. We further examined the effects of corporate characteristics and external environment on export decisions and export performance using the Survey of Business Activities of Statistics Korea and the export support data of Korea Agro-Fisheries & Food Trade Corporation. We analyzed the relationship between export strategy and export performance by type of agri-food firms by using the results of our survey. The research model and the survey questionnaire were reviewed by experts and reflected in the study. We also conducted interviews with high performing firms to qualitatively complement the results of the empirical results.

Research Results and Implications

In the analysis of decisions to export and the survival in export markets, lagged export status (a proxy for sunk cost) and productivity have positive effects on export decisions in both agri-food and manufacturing industries, supporting the self-selection hypothesis of the new trade theory. On the other hand, the learning-by-exporting hypothesis, which suggests that productivity increases with the entry of exports, was not significant. In addition, productivity improvement positively influenced the export stability in the manufacturing sector, but not in the agri-food sector. Therefore, in order to expand exports in the agri-food sector, it is important to create an industrial ecosystem that enables companies to improve productivity.

The analysis on the stability of the agri-food export found that companies that have stable exports are responsible for a significant portion of the agri-food export. The results show that the probability of continuing the export shipments is increased by market diversification but decreased by product diversification. It is also analyzed that the existence of competing export shipments increases the probability of continuing the export: the higher the relative export price and the export subsidy rate, the higher the probability of discontinuing the export.

Based on the survey analysis, we analyzed the relationship between export strategy and export performance (export per capita, export intensity, market diversification, export growth rate and export stability). As a result of the analysis of the whole company
sample, the relationship between strategy and performance differed depending on what is considered the performance indicator, and some strategies could have a negative effect on export performance. Overall, strategies focusing on export risk management and increasing market penetration were found to be effective in improving export per capita. Logistics and distribution-related strategies were analyzed to have a statistically significant relationship to the improvement of export intensity. Focusing on the main products, operating a public relations department, conducting field research and R&D investments were found to have positive effects on expanding export markets. As a result of analyzing the continuous exports by region and by product group, securing export volume has a positive impact on both export growth rate and stability. As such, focusing on the main products was effective in improving export growth and targeting Korean customers abroad: acquiring certification and managing export plans were effective in maintaining exports. In addition to the policy support for productivity improvement of the agri-food firms in general, it is advised to improve the provision of the overseas market information and joint marketing and logistics infrastructure in export markets.

To identify the effective strategies to enhance export performance by type of agri-food exporters, we divided the surveyed firms into four types. In the case of exporting fresh agricultural products (type A), we found that emphasizing the function of the product, labeling in local languages, cooperating with local distributors and managing export risk improve the export value and export intensity. It is shown that the firms in type A could expand the market if they meet the conditions on local marketing and logistics. Thus, policy instruments such as local marketing support would be necessary to expand the export market of fresh agricultural products. In addition, export insurance and overseas promotions are highly participative, so the efficiency of export support can be improved by reinforcing the policy instruments.

In the case of small exporters of processed agricultural products (type B1), focusing on niche markets and pursuing export stability through export volume and risk management are shown to be effective in improving export performance. On the other hand, in the case of medium-sized exporters of processed agricultural products (type
B2), aiming at large markets, seeking market diversification and investing in R&D would be effective strategies. Providing information on new markets and non-tariff barriers of them would enable B1 and B2 firms to diversify markets with support for initial investments. Support for quality enhancement and technological advancement with the aim of targeting niche markets would be effective for B1 firms to improve export performance. B2 firms supported by refined policy instruments would result in the industry-level export stability.

Agri-food exporters outsourcing production (type C) can be regarded as firms that concentrate on marketing and specialize in export businesses. The results of the survey show that in general, C firms have high export competitiveness, but they have difficulty in entering new markets because of external factors such as non-tariff barriers. Therefore, efforts to lower non-tariff barriers in trade negotiations would enable type-C firms to expand the export market. In order to expand the overall export of the agri-food industry, it is necessary to develop a policy to increase the export intensity of competitive exporters such as type-C firms.
National Agri-food Labeling and Improvement of Consumers’ Utilization

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Background of Study

As agri-food products are made through multiple stages including production, distribution, processing, and packaging, there is a variety of information that suppliers know but consumers may not know. Studies on consumer use of food labels are limited as most studies have mainly focused on the perspective of food labeling providers. Consumers in Korea are aware of the importance of agri-food labeling, but their utilization rate is not high enough. The frequent food-related incidents and accidents caused the reliability of food labeling to be low. The majority of consumers claim that there are too many agri-food labels and certifications that bring confusion to consumers, but some argue that it is necessary to increase the food labels on fresh foods, home meal replacement (HMR) foods, foods at restaurants, and delivery and take-out foods. There is still a lack of policy interest in promoting healthier food choices. The international community is emphasizing the function of the food labeling to promote healthier food choices.

Therefore, the purpose of this study is to provide the agri-food labeling utilization improvement strategies for consumers by identifying and evaluating the general status of the agri-food labeling in Korea and deriving the actual use and review of the agri-food labeling of consumers.
Study Methods

We reviewed the related literature to identify the role, function, and purpose of agri-food labeling. A series of processes from determining factors to consumers’ utilization of agri-food labeling to their impacts were conceptually established. We used a linear regression model to investigate the relationship between the determining factors to consumers’ utilization of agri-food labeling and their impacts, using the data from the food consumption behavior survey by the Korea Rural Economic Institute (KREI).

Advisory meetings with policymakers were held to identify the current state of labeling policies and issues. We also held Focus Group Discussion (FGD) five times with experts on agri-food labeling and Focus Group Interviews (FGIs) three times with consumers. The qualitative evaluation of the level of consumers’ utilization of food labeling and their perception was conducted through these interviews. For the quantitative evaluation of them, we analyzed the consumer survey data.

We examined the agri-food labeling system in other developed countries and derived implications. The analysis of the labeling policies in the U.S. and EU and the literature review on the policy implications were jointly conducted with Professor Lee Sanghyeon of Kangwon National University. We presented this study at the OECD International Conference on October 16, 2018, and incorporated the comments from the representatives of member countries into this study.

Results and Implications

Conceptual Framework of the Food Labeling Utilization

The conceptual framework of the food labeling utilization illustrates that consumers go through the following stages until they use the information on food labels: ① being exposed to food labels, ② acknowledging/recognizing the existence of food labels, ③ understanding the information correctly, ④ taking a confirming action, ⑤ food purchase decision-making which is the last stage of utilizing the food labels. Factors affecting the above process are 1) reliability and satisfaction with the food labels, 2) individual characteristics such as sociodemographic characteristics, product selection criteria,
and personal motivation, 3) food policies such as the quality of food labeling policies and campaigns for public awareness.

We test if the conceptual framework is valid and find the empirical evidence that the certified product purchase experience has a positive relationship with the confirmation of food labels, reliability, and satisfaction. We also could find that the group who read food labels more than the previous year showed improved dietary competency measured with the purchasing environmental competency index, the safe diet competency index, and the healthy diet competency index. This suggests that improving food labeling utilization would positively affect consumers’ health and nutritional status.

Agri-food Labeling Policy

Agri-food labeling is provided by five central government ministries including the Ministry of Agriculture, Food and Rural Affairs (MAFRA), and the Ministry of Food and Drug Safety and eighteen laws. All agri-food labeling is divided into five categories according to the following attributes: 1) hygiene and safety attributes, 2) nutrition and health attributes, 3) environmental and ethical attributes, 4) quality and standard attributes, and 5) product specification and information attributes. Hygiene and safety attributes include Hazard Analysis and Critical Control Point (HACCP) and Good Agricultural Practices (GAP). Nutrition and health attributes include nutrition labels (including nutrition level indication) and sodium content labels. Environmental and ethical attributes include organic, pesticide-free produce, non-antibiotic livestock product certification while quality and standard attributes include traditional food quality certification, agricultural product standard labeling. Product specification and information attributes include basic information (product name, content, etc.), other precautions, binge drinking warning signs, and recycling and garbage signs.

Consumers’ Utilization of Agri-food Labeling

As a result of analyzing food consumption behavior data by the Korea Rural Economic Institute, it is confirmed that 55.6% of adult consumers find agri-food
important, but only 16.0% of those surveyed responded that they use agri-food labels at the purchase decision stage of the buying process.

When comparing the number of consumers who read labels by food type, the food type with the highest rate was packaged meat (75.1%), followed by unpackaged meat (72.3%), grain (60.5%), packaged vegetables and fruit (58.0%), home meal replacement (HMR) foods (57.2%), processed foods (57.1%), and unpackaged vegetables and fruit (56.1%). When purchasing fresh food online, only 51.4% of the respondents answered that they would read the food labels, which was lower than offline purchases. Also, 38.6% of the respondents answered that they would read the food labels when eating out.

Consumers’ Perceptions and Evaluations on Agri-food Labels

The result of surveying consumers’ awareness of each food labeling system showed that there is no labeling system that more than 60% of consumers are well aware of. Although most labeling systems have gained increased awareness, the awareness level is still low. The awareness levels of the origin (58.2%), KS mark for processed foods (47.7%) and the organic certification (46.3%) are relatively high while the consumer awareness of other information on the labels was below 30%.

Agri-food Labeling in Developed Countries and Implications

We derive the following implications by examining the food labeling system, policy changes and consumers’ use of the labels in the U.S., EU, and Japan.

First, food labels and nutrition facts are being integrated. For example, in the EU the new regulations on food labeling were initiated from December 13, 2014 by integrating the previous labeling law of food and the nutrition facts guidelines. Likewise, the new food labeling law was initiated in Japan from April 1, 2015 by integrating the previous food labeling regulations by the Japanese Agricultural Standard Law and the Health Promotion Act. If different ministries’ food labeling systems have a similar purpose and expected role, it would be efficient to manage them through cooperation between ministries.
Second, the provision of food labels is expanding to meet consumers’ needs. In the United States, consumers are able to obtain calorie and nutrition information from chain restaurants and similar retail food establishments. In the UK, even when purchasing food products online or by phone or mail order, consumers can gain the food information at the same level as when purchasing food in a retail environment through the websites or catalogs. In Korea, it will be necessary to expand the health and nutrition labeling information system to various channels where food purchasing occurs to reflect new consumers’ demand.

Third, the way of displaying the food label is improving. The current trends of agri-food certification and labeling systems in the U.S. and EU are focused on providing consumers with essential information in a more effective way. It is noteworthy that the voluntary nutrition labeling schemes that display main nutrient contents in a chart form, such as Facts Up Front in the U.S., 1 plus 4 model in Germany and Nutri-Score labeling system in France, are being enforced to help consumers in their decision making process. If these schemes are activated in Korea, consumers can easily access the information they need and make informed choices.

Fourth, various methods of delivering nutritional information to consumers are being developed. Nutrition facts labels on the shelves, the utilization of nudge in a healthy direction at the purchasing point, the introduction of smart labels can be good examples of various ways of delivering agri-food information. In particular, some U.S. retailers including Giant Food, Shop & Shop, SuperValu, and United Supermarkets are using their own nutrition labeling on the shelves for marketing some items.

Lastly, certifications by non-government organizations are increasingly used. Regarding the U.S. industry certification, manufacturers voluntarily provide information on their labels through their own quality certification system. In Japan, each item of agri-food products in the market presents the certification by related associations. We find that establishing a certification system that flexibly manages diverse private certifications will help to promptly respond to changes in market environments.
Directions to Enhance Consumers’ Utilization of Agri-food Labeling

The directions to enhance the utilization of agri-food labeling include ① building a consumer-friendly labeling system, ② adapting to changing food consumption trends, ③ enhancing the reliability of food labeling, and ④ promoting healthy food choices. In order to improve agri-food consumers’ labeling utilization, it is necessary to 1) adjust the overall system of food labeling to be consumer-friendly, minimize the area of information that can be duplicated or misunderstood, improve the awareness and understanding of food labeling. 2) meet the new food label demand of consumers in accordance with the changing trends in food consumption (e.g., increase in online and home shopping, Home Meal Replacement (HMR) expansion, and food truck popularization), 3) strengthen the trust in food labels provided by the government through improvement of labeling and management systems as well as the labeling methods. Lastly, 4) smart labeling policy needs to be designed and implemented to encourage consumers to make healthy food choices and benefit from the agri-food information featured on food products.

Detailed Strategies for Enhancing Utilization of Agri-food Labeling

Detailed strategies include ① selection and concentration of basic components required for food labels, ② expansion of food labels that respond to consumers’ demands, ③ consumer-oriented maintenance of agricultural product certification marks, ④ use of easy-to-understand food labeling methods for consumers, ⑤ establishment of the institutional and organizational basis for healthy food choices, ⑥ effective labeling education and promotion, and ⑦ improvement of the reliability of agri-food labeling.
An Evaluation of VAT System in Agricultural Sector in Korea

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Purpose of Research

This report aims to examine the performance and the limits of the value-added tax (VAT) system which applies to agriculture and agribusiness, including zero rate which applies to agricultural inputs, tax deduction related to machinery or materials for agriculture and fisheries and the deductions of fictitious input tax amounts for agricultural products with a focus on the VAT exemption for unprocessed agricultural products. The evaluation on the VAT system associated with agriculture is expected to provide policy suggestions which can lead to an increase in efficiency of the VAT system in the long run.

The VAT exemption for unprocessed agricultural products has merits such as easing household income regressivity and cutting farmers’ tax compilation costs, but also has demerits such as cascade effect, catching-up effect, and administrative costs due to vague criteria for tax exemption.

The zero rate VAT and VAT exemption applied to machinery or materials for agriculture and fisheries contribute to reducing farmers’ production costs, but also have limits in that they make market distortion which leads to the excessive use of inputs that can be environmental pollution source, they cost a lot in administration, and it is needed to regularly review whether to extend this sunset law.
Deductions of fictitious input tax amounts for agricultural products support small business owners, but have problems including controversy over the adequacy and limit of the deduction rate of fictitious input tax amounts, discrimination by type of business, and reverse discrimination against domestic products.

Since the introduction of the VAT system, consumers’ food consumption trend has been changed. For example, the consumption of processed foods and dining out have increased while the proportion of food in household expenditure has decreased. Nevertheless, there have not been in-depth studies on the overall direction of the VAT system related to agriculture, including the tax exemption system, in accordance with the changed consumption environment. This study is conducted to assess the performance of the VAT system related to agriculture under the changing consumption trend and to examine tasks for higher efficiency of the VAT system.

**VAT System Related to Agriculture: Performance, Limits, and Alternatives**

The benefits of the current VAT system related to agriculture include the tax exemption system for agricultural products which contributes to the redistribution of household income, compilation cost cuts due to exemption from making VAT returns, and a reduction in farmers’ production costs. However, the limits of the system decrease the benefits considerably, and the socio-economic costs for maintaining the current system are high. For example, there are cases that the effect of tax exemption for agricultural products is not delivered to consumers due to cascade effect and catching-up effect. Also, producers of agricultural machinery or materials, as well as farmers, obtain welfare increase because tax exemption reduces the price of agricultural inputs which results in an increase in input consumption.

Although the current tax system has achieved the policy goals, its socio-economic costs are not negligible. Therefore, we should consider a better alternative if it exists.

The following are two alternatives. First, taxing agricultural products can be considered. Second, it is possible to maintain the current system and solve its problems
through partial amendment or supplementary measures.

Taxing agricultural products is radical but provides the groundwork for fundamentally solving the above-mentioned problems to a considerable degree. First, the problems of the tax exemption for unprocessed agricultural products are solved. Also, as farmers should report VAT collected and farmers’ tax invoices are issued, it is possible to naturally abolish special tax treatment related to agricultural inputs and deductions of fictitious input tax amounts. This can resolve the problems of the existing VAT system associated with forward and backward linkages with agriculture to a considerable extent.

Nonetheless, while solving the existing problems, taxing agricultural products may cause side effects such as a decrease in the consumption of the products, the consequent decline in farm households’ agricultural income, and an increase in the tax burden in the low-income bracket. If these side effects are bigger than the benefits of taxing agricultural products, it will be more reasonable to maintain the current system and prepare supplementary measures.

The second method cannot solve the problems of the current system fundamentally, but does not cause social confusion due to the system change and conflicts between agricultural producers and consumers, that is, economic agents. Therefore, the second method can be reviewed as an alternative.

**Effect of Imposing VAT on Agricultural Products**

We conducted a quantitative analysis of the ripple effect of the first alternative, taxing agricultural products. We analyzed the impact of imposing VAT on agricultural products on the consumption and prices of the products by using a stochastic equilibrium displacement model. The result shows that imposing a tax rate of 10% on agricultural products decreases rice consumption by 2.01% and increases consumer prices by 7.61% and sales by 5.45%. In the market for livestock products such as beef, pork, and broilers, the consumption is estimated to decline by 3.81%, 3.88%, and 3.51% respectively. Like this, taxing agricultural products is expected to decrease the consumption of the products and agricultural income by raising their prices.
Moreover, taxing agricultural products increases consumers’ tax burden. Imposing a tax rate of 10% on the products increases the total urban households’ tax burden by 1.37 times the case of tax exemption. Particularly, the tax burden of low-income households will increase more than that of high-income households. According to the estimation result, the tax burden rate of first-decile households becomes 1.71 times the case of tax exemption, while that of 10th-decile households grows 1.22 times. Also, single or two-member elderly households are expected to experience an increase in the tax burden rate higher than the average. These results show that imposing VAT on agricultural products worsens household regressivity.

Last, if agricultural products are taxed without preparation in terms of the environment for tax payment, compilation costs which farmers should pay are expected to be considerable. In case of taxing the products, farm households that have a duty to make their VAT returns are estimated to be approximately 26% of total households. The age of farm managers of these households is judged to be younger than that of farm households exempted from making VAT returns, and the farming size of the former larger than that of the latter. Nevertheless, a big chaos is expected if agricultural products are taxed without establishing tax payment infrastructure in rural areas where dealing with tax affairs and keeping account books are not common. Considerable costs occur given compilation costs and the psychological burden of dealing with unaccustomed tax affairs.

**Policy Suggestions for the VAT System Related to Agriculture**

The current VAT system related to agriculture is evaluated to have achieved its purpose. Nonetheless, the considerable socio-economic costs of maintaining the system make it inefficient. Therefore, it is necessary to seek an alternative to support farmers and consumers with less costs.

In terms of efficient support, direct support through government expenditure can be an alternative, rather than the method of tax expenditure. For instance, it is possible to expand direct support for low-income households’ food consumption instead of
changing tax exemption for agricultural products to taxation on them. Also, if additional tax revenues from taxing agricultural products are included in the Agriculture and Fisheries Structure Adjustment Special Account and used for direct support projects to enhance farmers' income, it becomes possible to more support groups that actually need government support.

Thus, it is needed to positively consider taxing agricultural products that have been tax-free as an alternative to the current system. Taxing the products can also be considered in terms of the development of agriculture and agricultural policy.

Most of all, taxing agricultural products can be considered in terms of the development of agriculture and agricultural policy. For the future-oriented development of the agriculture sector, it is necessary to include the sector in the network of the VAT system. Imposing VAT on agricultural products can be positively reviewed in terms of strengthening agricultural competitiveness by farm households' keeping account books and improving agricultural management techniques. If farm households keep account books and report their sales, it is possible to implement farmer support policies based on official sales records. In addition, imposing VAT on agricultural products can contribute to improving the transparency of transactions in agricultural machinery, materials, and products.

However, as analyzed above, taxing agricultural products makes farmers and consumers pay socio-economic costs due to the decrease in the consumption of the products, the increase in farmers' compilation costs, the rise in consumers' tax burden, and the worsening of income redistribution. While the benefits of taxing the products are invisible and gradual over a long period of time, the costs can be visible and immediate. Also, the agricultural sector mainly receives the benefits of the system change, and consumers can indirectly experience the effects only through safe and healthy food due to the advancement of agriculture. Therefore, taxing agricultural products can cause conflicts concerning interests between consumers and farmers.

Thus, it is required to carefully review taxing the products. Although its need is recognized for the development of agriculture and agricultural policy, it is necessary to consider the consequent socio-economic costs, conflicts between economic agents,
and social chaos due to the system change. It is desirable to review taxing agricultural products only when the overall environment is created, including forming a national consensus and building the infrastructure for tax payment.

Further, imposing VAT on agricultural products should be linked with discussion on reforming the overall tax exemption system. Because various goods and services in addition to agricultural products are tax-free, it can cause another inefficiency to exclude discussion on taxing the goods and services and only discuss taxing agricultural products. Imposing VAT on agricultural products should be reviewed by considering the order of priority between taxing other tax-free goods or services and taxing agricultural products in discussion on the overall reform of the tax exemption system.

In conclusion, it is significant to identify the problems of the VAT system related to agriculture and review the need for its improvement. Taxing agricultural products should be considered from a long-term perspective as a way to solve the problems. In the short term, it is desirable to focus on setting up plans to expand support for farmers' tax payment and plans to solve the problems concerning the tax system. Concretely, it is needed to improve the tax support effect by strengthening the promotion of and education on special taxation, and to draw implications for Korea by researching overseas support systems for farmers' tax payment. Last, it is required to contribute to farmers' efficient farm management and prepare for discussion on a future tax system by examining ways to establish a system for supporting farmers' tax payment.
The Policy Agenda and Direction for Enhancing Multifunctionality in Agriculture

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Background

The elements that make sustainable agriculture vary according to previous studies. However it is common in most of studies that sustainable agriculture implies that it can reproduce economically, maintain broader relationships with other sectors, including the agricultural sector, and utilize natural capital sustainably without the overburden of the environment and ecosystem. In this study, we examine the reason for degeneration of Korean agricultural sustainability. It could be due to the pressure of market opening and aggravation of terms of agricultural trade as well as the changes in social demand for the function and role of agriculture.

The problem about the sustainability of Korean agriculture leads to the question of how to make the balance between economic, social and environmental sustainability. In order to answer this question, we have to decide whether we shift our focus to one of the various functions and roles performed in the agricultural sector. Now it is a time to consider whether the function, role, and direction of Korean agriculture should be changed.

Research Objective

The objective of this study is to propose the direction and tasks needed to expand the multifunctionality in agriculture in the sense that the sustainability and multifunctionality in agriculture can make a virtuous cycle.
Sustainability and Multifunctionality in Agriculture: Theoretical Review

In this study, the key elements of multifunctionality are defined as 1) public goods which are jointly produced by agricultural activity; 2) it brings positive and negative externalities but is not sufficiently provided due to the market failure; 3) thus market intervention is required to provide it at the socially optimum level. Accordingly, agricultural activity produces a variety of positive and negative externalities, but if there is no government intervention, positive (negative) externalities are provided less (more) than social demands. In particular, this study explicitly includes negative externalities coming from agricultural activity to define multifunctionality in agriculture. Taking this redefinition, the expansion of multifunctionality in agriculture implies shifting the direction of agriculture by providing incentives in the public sector to increase (decrease) the positive (negative) externality, thereby changing the farming system in a desirable way.

Policy Direction for Multifunctionality in Agriculture

In this study, we insist that priority should be given to the environmental aspect, especially the environmental multifunctionality in agriculture. Since environment-friendly agriculture that has been done is not sufficient to expand environmental multifunctionality in agriculture, we suggest that new policy should be based on the environmental stewardship. In other words, farmers need to act as ‘stewards’ to fulfill their obligation to supply agri-environmental public goods on behalf of the social members. Also it is necessary for the social members to shift to the way of paying the farmers for the social benefits.

Policy Agenda for Multifunctionality in Agriculture

First, we should strengthen the practice of environmental stewardship by taking agri-environmental policy as a starting point, but we must gradually expand the range and definition of multifunctionality so as to respond to changes in conditions and raise agricultural sustainability. In addition to traditionally important agricultural functions
and categories such as food security and environment-friendly agriculture, urban agriculture, food safety, animal welfare and biodiversity can be new functions. Second, if the eligibility criterion is applied, farmers that obtain their income by focusing on farming, young farmers, and small farmers who are able to participate in joint activities for expanding multifunctionality should be included in the policy object. Third, the priority of compliance set by current laws or regulations should be set as a reference level. And then the scope and level of compliance will be stepped up in consideration of agricultural conditions, legislative status, feasibility check, and farmers’ acceptance of policies. Fourth, there is a need to revise the definition and scope of multifunctionality in agriculture and the responsibilities of related entities within the Constitution and the Framework Act on Agriculture, Rural Areas and the Food Industry. Fifth, it is necessary not only to adjust the proportion of government budgets to reflect changes in social demands but also to change the characteristics of budget. It is possible to review measures regularly to adjust the proportion of the budget for a particular period based on the 'Agriculture, Rural and Food Industry Development Plan'. Sixth, there is a need to change the basis of support for agriculture to request social investment instead of the way of emphasizing the need to support the value of functions that the agricultural sector carries out but not evaluated and compensated. Finally, it is necessary to reduce the top-down / public offering methods and reinforce the bottom-up / autonomous selection measures at the action stage. The feedback process also needs to be changed. Evaluation indicators should be made in such a way as to assess whether they have achieved the policy objectives and to improve them in such a way as to accumulate for a sufficient period of time. Also it is necessary to shift some of the indicators from a performance-based to a driving-force-based approach.
A Study on Establishing an Information System for Agri-Environmental Resource Management

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Background & Purpose of Research

The purpose of this study is to present the basic directions and tasks for establishing an information system in line with the expansion of agricultural environmental resource management, which is agricultural environment preservation, together with agricultural production.

Method of Research

This study investigated the current state of the information system related to agricultural environment resource management information established in Korea before and after introduction of environment friendly agricultural promotion law through literature search, internet search, and expert interview. In addition, through the case study, we reviewed the progress and management information of UK agricultural environmental resource management policy. In addition, through the literature survey and Internet search, the development trend of information and communication technology related to agricultural environmental resource management was examined. On the other hand, the information related to the spatial scale and spatial heterogeneity of the information system constructed through the GIS analysis was mapped.
Research Results and Implication

In Chapter 2, we conducted a theoretical review of the agricultural environmental resource management information system. Agri-environmental resources have expanded to include non-market inputs such as landscapes and biodiversity, as well as non-market inputs such as soil and precipitation. And the resources are public goods that are not efficiently allocated due to incompleteness of property rights due to non-excludability and non-rivalry. Therefore, it is necessary to manage the agricultural environment resources which have the characteristics of public goods considering the spacial scale and spatial heterogeneity.

On the other hand, agricultural environment resource management information is necessary to manage agricultural environment resources with the nature of public goods. This study analyzed the agricultural environmental activities of the OECD, UK, Agricultural Environment Conservation Program. And 14 kinds of information were extracted in four major areas: soil and soil conservation, agricultural water quality and water quality management, biodiversity and habitat conservation, and rural landscape management.

In Chapter 3, the current agri-environmental resource management information system is structured in terms of quantitative information that is necessary for the management of agricultural environment resources by individual sector. However, there is no unified system because the information system is not constructed from the integrated perspective of agricultural environment resources. In addition, it is found that the quality of the information system is insufficient for analysis for preservation of agricultural environment. And also, it is needed to set up regional units from an integrated viewpoint of agricultural environment preservation, and collect unified data for each unit. And it is necessary to systematize regional comparison based on the status and change of collected agricultural environmental resources so that agricultural environmental conservation activities can be cost-effective.

In Chapter 4, we reviewed the direction and management information of agricultural environment resource management policy in England which is an advanced country of
agricultural environment resource management. In the UK, agriculture and environment resource conservation activities are being carried out by informants, mainly farmers, and they are building and providing information to enable cost-effective agricultural environment conservation activities for farmers. And the technology development during the 4th Industrial Revolution period predicted that the farmer who is a non-specialist would improve the information utilization ability enough to carry out the field-customized agricultural environment activities through smart phone and big data.

In Chapter 5, based on the development direction of the information system in England and the technology development in the 4th Industrial Revolution period, we draw 3 policy directions to overcome limitations of the domestic agricultural resource management information system. First, in order to support the existing business, the information that is individually constructed is redesigned under the integrated platform of agri-environment resource management and the management is changed to integrated management such as coordination of roles. Second, in order to reduce the external effects of agri-environment resources, individual information and information system should be upgraded considering spatial heterogeneity, the difference in the quantity and quality of resources by location. Third, the information system is centered on the accessibility and participation of farmers rather than the government information management, so that the 4th industrial revolution technology is popularized and the farmers become the agricultural environment sensor and the big data analysis becomes popular. In order to implement this basic direction properly, three strategies have been developed. First, it is necessary to supplement existing information that has been constructed by the present information system. The second is the construction of newly required information with the introduction of agri-environment resource management. Thirdly, it is needed to advance the future-oriented information that is understood through the development trends of information technology and advanced countries. In order to lead the three strategies to success, six, four, and four tasks were derived respectively.
Background of Research

- The agricultural development region scheme was introduced in 1990 for the purpose of securing good agricultural land and improving agricultural productivity, and agricultural development regions were specifically designated in 1992. However, due to the changes in economic conditions, the purpose of quantitative and qualitative securing of agricultural land was not sufficiently achieved.

- Unplanned barns, warehouses, farmhouses, processing facilities, and public facilities are impeding the conservation of good agricultural land in the agricultural development region.

- In addition, with the recent discussions on the reform of the direct payment system, there has been discussion on how to integrate rice fixed (decoupled) direct payment and dry-field farming direct payment into a Public-purpose Direct Payment System (tentative name).

  - Direct payment is changing the farm paradigm to enhance not only farmland maintenance and management but also environmental protection.

  - Therefore, the farmland conservation system should be improved to contribute to the transformation of the agricultural paradigm.

- Therefore, after 25 years since the implementation of the agricultural development
region program in 1992, we are now evaluating the farmland conservation policy, especially the agricultural development region program, and seeking for ways to improve the system.

**Research Method**

- The research is conducted through literature review, overseas field survey, basic statistics and quantitative analysis of spatial data and raw data related to farmland information.

- In the literature review, the problem of the farmland conservation system represented by the current agricultural development system is analyzed through the review of domestic and foreign preceding research to find ways to conserve the good agricultural land.
  
  * The status of the conserved farmland and the operation of the specific agricultural district system in Taiwan, which is similar to the agricultural situation in Korea, was investigated through overseas field survey.

- In order to identify the current status and problems of agricultural development regions, relevant GIS spatial data and raw data of the Ministry of Agriculture, Food and Rural Affairs (MAFRA), Rural Development Administration (RDA), Korea Rural Community Corporation, Ministry of Land, Infrastructure and Transport are collected and analyzed.

  * The agriculture database by MAFRA, the database of agricultural management, the GIS data for the agricultural development region by the Korea Rural Community Corporation, the continuous cadastral map and officially assessed land price data by the Ministry of Land, Infrastructure and Transport, the land suitability grade per land category and slope GIS data by the Rural Development Administration and GIS data of Environmental Conservation Value Assessment Map by the Ministry of Environment were used.

  * Based on the constructed data, the research methodologies such as crossing method, human development index and nonparametric estimation method were utilized to identify the size of area appropriate to be conserved.

  * Logit analysis was conducted to analyze the factors affecting land use change.
Analysis of Use of Farmland in Agricultural Development Regions

About 3,000ha of farmland in agricultural development regions is being used every year for the purpose of public facilities and barns, agricultural facilities (warehouses, processing and drying facilities), farmhouses and farmers’ community facilities, which are not directly related to agricultural production, and this hampers farmland conservation in agricultural development regions.

In terms of the standard of land development, the land use restriction does not consistently apply to the agricultural development region as conservation area.

- Agricultural land reserve has limits as conservation area because the acceptable level of land development is too high compared to the agricultural development region.

Farmland conservation contributions are levied on agricultural land owners for the purpose of restraining diversion of farmland, but the effect of restraining agricultural land diversion is not significant at the current imposition method and levy level.

- Farmland in agricultural development regions with lower official prices is preferred.

Analysis of Designation and Lifting Status of Agricultural Development Regions

Although it is possible to designate the agricultural development region by the request of residents, so far there has been only one case that the land became an agricultural development region by the request of residents as the compensation for the loss caused by land use restriction according to regulations is insufficient.

The criteria for designation of agricultural development regions are based on farmland grouping standards which vary by land zone (over 10ha of plain area, over 7ha of middle area or over 3ha of mountain area)

- However, the lifting requirement is 3ha regardless of the land zone. Therefore, there are some zones that do no meet the designation standard, but do not satisfy the lifting standard.

As of 2018, 78.5% (81.5% when including agricultural facilities) is being used for the
purpose of agriculture, after the lifting of agricultural development regions in 2007 and 2008.

- Farmers in underdeveloped areas may express complaints such as a decrease in direct payment amount due to the lifting of the agricultural development region, and it is necessary to reflect local characteristics in the conditions for lifting the agricultural development regions.

**Agricultural Land Subject to Conservation by Indicator**

- The paradigm for the conservation of farmland needs to be changed as the past agricultural policy based on productionism and efficiency has been transformed into a sustainable farming based on strengthening environmental protection and stability.
- In addition to the current agricultural land grouping and land productivity standards, areas with high environmental and public benefit effects of agricultural land should also be actively conserved and managed.

- The area of cultivation suitable for rice paddies and fields in agricultural development regions is 346,000ha, accounting for 43.8% of the total area of agricultural development regions, 790,000ha.
- Therefore, it is necessary to make efficient farm land use decision in consideration of such cultivation land when using farmland for non-farmland use type farming activities such as barns, cultivation greenhouse, etc. in agriculture development regions.

**Implications of Major Countries regarding Farmland Conservation**

- In the case of Japan and the United Kingdom, they clarify the areas to promote agricultural development (Japan designates 89.6% of the whole farmland for agricultural land use and the UK promotes the entire rural land), and link with various national and urban plans.
- In particular, Japan has designated specific areas within the agricultural land area as special land if necessary for agricultural development.
In the UK, farmlands (grades 1, 2, and 3a) which are excellent and highly utilized are actively conserved and for projects where agricultural land development is inevitable, priority is given to lower grade land (grades 3b, 4 and 5).

Taiwan is promoting the establishment of a virtuous circle system that enhances the comprehensive rural development plan and the integration of agricultural production, rural life and environment ecology in the designation of a specific agricultural district.

Summary and Implication 1: Improvement of Criteria in Agricultural Development Region Designation

From the point of view that even the farmland outside the agricultural development region should be actively conserved and managed, the criteria in the designation and lifting of agricultural development regions shall be any grouped land over 3ha regardless of its land zone. By doing this, the area to be an agricultural development region can be expanded and consequently, the agricultural development region will be expanded.

Designation of agricultural development regions and agricultural protection zones shall be mandatory in all areas according the Farmland Act. Other use areas shall be designated selectively according to local characteristics (e.g., agricultural facility districts) instead of being designated uniformly for all cities and counties.

- It operates flexibly in such a way as to allow the necessary usage classification (e.g., landscape such as Daraknon which is a long terraced rice paddy field, facility-agricultural district, livestock district, etc.) according to local agricultural characteristics.

- However, activities other than agricultural production can be directed to non-cultivated sites within the agricultural development region. Also, it is necessary to apply some activity restriction according to usage classification (only certain relevant development activities are permitted) in order to have legal binding power.
Summary and Implication 2: Improvement of Agricultural Development Region Operation Plan

▶ The agricultural development region accepts the activity limitations of the current agricultural development region and allows only those activities directly related to agricultural production and farmland improvement.

- The first grade farmland (about 44,100ha), which has good environmental value according to the National Environmental Assessment standard, shall be also actively incorporated into the agricultural protection zone by restructuring it for the designated purpose of the agricultural protection zone, and the name of the agricultural protection zone shall be changed to the agricultural environment protection zone. And the enacted agricultural environment protection zone applies the act limitation more strictly than the existing agricultural protection zone.
- In the “Act on the Management and Use of Livestock Manure”, an agricultural development region shall be added to the designated area for livestock farming restraint, and the development activities requiring construction permits and architectural designs under the “Building Act” shall need the permission for farmland conversion.

▶ Farmland owners in agricultural development regions are given a transfer income tax exemption in terms of compensation for regulatory losses. The exemption is achieved by applying a special deduction rate for long-term holdings in transfer income tax.

- The inheritance and gift tax deferment program shall be introduced so if a farm owner, who has inherited agricultural land in an agricultural development region for 20 years or more, continues to use farmland without converting the farmland. his/her payment of inheritance tax (gift tax) is deferred and the tax payment is waived after 20 years.
- In order to compensate the loss caused by land use restriction in the agricultural development region, the farmland management fund shall be used to pay the farmland owners with farmland conservation direct payment of 200,000 won per ha.

▶ In order to inhibit the farmland conversion in agricultural development regions from the viewpoint of protection of the good agricultural land, the principle of not allowing 100% reduction for the land conversion in agricultural development regions is suggested.
• Even in the case of facilities for public use or farmers’ convenience, 100% reduction is not allowed in agricultural development regions. Instead, a maximum of 50% reduction is applied.

▶ In the situation where the system guaranteeing the implementation of the agricultural land utilization plan is not available, it shall be operated in connection with the urban management plan for the improvement of land use.

• In terms of securing efficiency of investment and loan for the farmland maintenance project at the regional level, when farmland conservation contribution is imposed, the relevant local government shall be obligated to support part of agricultural production base maintenance cost by utilizing farmland management funds.
How to Advance Rural Elderly Literacy

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The purpose of this study is to analyze rural elderly people’s literacy and investigate how to advance their literacy level. This study examined the relation between such literacy level and quality of life, and suggested the effective educational policies to improve the literacy level in the rural community. For this purpose, this study analyzed relevant research, existing statistics, professional conferences, personal interviews, case studies, and the questionnaire survey.

First, this study analyzed elderly people’s literacy level in the rural community by defining literacy and developing the measures to evaluate literacy level by analyzing previous literature. Existing statistics and the survey data in this study showed that literacy education was necessary for about 58% of elderly people in the rural community that was two or three times more than those in the urban area. It also indicated that one-third of rural elderly people with a low literacy level experienced difficulties in using public services that a regular person can use without difficulty.

Second, this study examined the relation between elderly people’s literacy level and their quality of life in the rural community by evaluating the effect of literacy level on participation in social activities, health status, and quality of life. The econometric analysis with the survey and the existing statistical data showed that elderly people with a high literacy level were more likely to obtain social support, use public services, and care about political events than those with a low literacy level. It also indicated that the
high literacy level improved mental health condition, financial status, and their quality of life. In addition, functional literacy was the more significant factor to improve their quality of life than basic literacy.

Furthermore, this study analyzed the supply of literacy education to eradicate illiteracy in the rural community by investigating the literacy education policy of the central and local governments. The analysis showed that 96% of people with a low literacy level in the rural community had never received literacy education, although there was high demand for it. One of the reasons for the low participation would be inappropriate educational interventions by government that failed to meet the demand in the rural community. Another reason would be the restricted access to literacy education service in the rural community, such as insufficient education information, fear of being late, health problems, and insufficient time for the education.

In addition, this study analyzed the factors in activating literacy education by visiting well-managed and ill-managed literacy education programs and comparing such governments. The comparison between these two government groups showed that the local governments with well-managed literacy education programs had the sufficient amount of investment in literacy education. They founded laws to construct the effective governmental system to support literacy education. However, the local governments with ill-managed literacy education programs failed to realize the importance of literacy education, despite many prospective consumers. These governments were not interested in founding laws for literacy education and did not have a motivation to invest public funds in literacy education.

Finally, based on the analysis result and the relevant best practices, this study suggests the basic direction and practical measures of governmental policy for higher literacy level. For the basic direction, the governments need to set goals to strengthen the responsibility of the central and local governments, support lifetime capacity development programs as well as literacy education, and develop the literacy education policy fit for the elderly people the rural community. Educational authorities also need to support the link between basic literacy education and advanced/applied literacy education and provide the rural community with an effective policy that satisfies the
educational demand in the rural community. For the practical measure of public policy, this study suggested the governmental system that supports the easy Korean campaign, improves quality of life in the rural community, constructs a statistical database for literacy in the rural community, develops literacy textbooks for rural elderly people, proposes systematic education programs for teachers, and discovers the demand for literacy education.
Social Innovation Policy Implementation Plan for Improving the Rural Settlement Environment

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Background of the Study

Due the weakening demand owing to depopulation and aging population, the rural settlement conditions related to public and living service are in a difficult situation and it is unlikely to be improved in a short period of time. There is also a limit to the way to improve the settlement conditions by simply expanding financial input. Recently, the social innovation policy that focuses on the social value of technological innovation is spreading as a new tendency of innovation policy. Social innovation policies and outcomes focusing on social values such as social problem solving can be utilized to improve the rural settlement environment through provision of new public and living services. However, innovation policy and support projects for improving the rural settlement environment are not being systematically implemented compared to urban areas or other policy sectors. The purpose of this study is to present the direction and tasks of social innovation policy using technology to improve the rural settlement environment. In order to achieve this, we identified the social innovation demands for improvement of rural settlement conditions and analyzed social innovation conditions for improvement of the rural settlement environment.
Study Methods

In this study, we conducted literature review, statistical data analysis, an expert questionnaire survey, field visit survey, and focus group interviews. For the literature review, domestic and foreign research, science and technology, relevant ministries’ plans, policies, projects, and policy programs in foreign countries regarding social innovation policy were reviewed. For the statistical data analysis, the existing statistical data on the rural settlement environment were reviewed, and the characteristics of the innovation activities were compared and analyzed by extracting the national R&D project information on the urban and rural settlement environment from the national R&D project database. The questionnaire survey on the demand for rural social innovation was conducted with experts in the rural environment field. In addition, interviews were conducted at sites where the policies and programs related to social innovation are being carried out. Lastly, focus group interviews were conducted with experts in traffic, education, housing and energy sectors to investigate rural social innovation demands and policy tasks.

Results and Implications

The constraint factors of revitalization of rural social innovation were derived by analyzing the conditions of the innovation policy implementation regarding the improvement of the rural settlement environment. The basic plan for the innovation activities regarding the rural settlement environment was found to be insufficient. In consequence, the financial input for innovation activities regarding improvement of the rural settlement environment was lower than that of urban areas. Also, the number and diversity of entities participating in R&D with interest in improvement of the rural settlement environment were relatively low compared to urban areas. Lastly, since the innovation entities are concentrated in urban areas, the base of innovation entities to address the demands of rural areas is poor.

The expert demand survey was conducted to derive the demand for social innovation in rural transportation, education, housing, energy, health and welfare sectors. We
found that in order to improve rural education conditions, it is necessary to develop educational contents that can be used in rural areas and demonstrate an ICT-based school operation model. Also, in order to improve rural transportation conditions, it is necessary to carry out a variety of empirical studies at the local level for the promotion of national R&D projects including the utilization of unmanned vehicles and improvement of regional traffic safety conditions. The survey result suggested that development and application of low-cost rural housing and energy supply models and distribution of living technology for saving heating costs are needed for improvement of rural housing and energy condition.

In addition, it is found that regarding each social innovation demand, there is a difficulty in activating actual innovation due to the constraint factors mentioned above. There is a need for research and development at the national level, but the mid- to long-term national R&D tasks and empirical research on rural areas are insufficient. Thus, it is necessary to increase the proportion of settlement environment-related innovative activities of agricultural and rural innovation entities and to expand a cooperation network with other sectors. Furthermore, it is necessary to nurture competent authorities to carry out the educational projects and strengthen capacity to promote the technology development, technology dissemination and education business with an interest in the rural issue.

Based on the results of the analysis, the direction of the social innovation policy and the policy tasks for improving the rural settlement environment were derived. First, in relation to the policy implementation system, it is necessary to include social innovation-related policy measures such as R&D for improvement of the rural settlement environment and technology diffusion in the basic plans for agri-food science and technology and the rural settlement environment. Second, it is necessary to systematically identify the demands for rural social innovation based on the relevant plan. Third, it is necessary to reflect the innovation programs in policies and projects for rural development. Fourth, it is necessary to cultivate various types of entities that are able to carry out innovation activities with interest in social problems in rural areas by utilizing existing policies and projects such as cultivation of rural community companies. Lastly, in addition to the
existing research areas, the innovation organizations in the agricultural and rural sectors are required to expand their functions to actively promote innovation activities for the improvement of the rural settlement environment.
Globally there has been a growing awareness that not a particular group but the whole society should share the fruits of economic growth, thereby reducing inequality and conflicts among economic groups and enabling sustainable economic growth. In the agricultural sector, the need for inclusive growth through the vitalization of the social economy has increased, due to the recent stagnant growth of the sector and the relatively high level of income inequality among farmers. For the sustainable development of agriculture and rural communities, economic vitalization is necessary in broad sectors of farming and rural areas. Given the distinct characteristics of rural areas, it is needed to diagnose the areas’ need for the social economy and set up plans to develop the social economy in the areas.

The number of head offices of agricultural cooperatives declined from 1,161 in 2013 to 1,131 in 2017. Thirty-four percent of social enterprises are operated in rural areas and 66% in urban areas. 1,514 village enterprises are operated as of the end of 2017. Village enterprises are established and run more actively in rural areas (64%) than in urban areas (36%). In rural areas, 30.5% of general cooperatives are distributed; 69.5% are in urban areas. There was only one social cooperative in 2012, and 100 social cooperatives were founded in 2013. The number increased by 71% on annual average, and 848 social cooperatives are operated as of 2017.

According to the result of the implementation monitoring of the Rural Services
Standard, the implementation status of healthcare services, senior care, infant care, elementary school fostering and the provision of transportation to school, business start-up and employment consulting is about 70%, which needs considerable improvement. This means that government or market services are not delivered properly to these areas in rural regions. Rural residents had more demand for expanding health and medical facilities, social welfare facilities, and culture and arts centers compared to urban residents.

As for opinions on "promoting the social economy," one of the Moon Jae-in government's major policy tasks, 10% of respondents answered that they heard the term for the first time, and 53% answered that they had heard about it but did not know its exact meaning. According to the survey result, 11% of respondents do not think it necessary: 27% know about it well and think it a necessary policy. As the most urgent area for improving rural living conditions, medical and health care (31%) was pointed out, followed by culture (22%), a bond with neighbors (18%), education (14%), and public transportation (13%).

When carrying out a project needed by a village, 55% of respondents could not find an institution that provides support. Respondents who can receive help from an institution established by a city/county office account for 37%, and the answers that they can receive help from a private institution are insignificant. On the question, "Who should be the main agent of improving the conditions of the village?," 50% of respondents answered that the local government should take interest and solve the problem. Ten percent responded that the central government should be in charge; 39% responded that residents should solve the problem themselves or through the support of the local or central government.

Recently Korea’s social economy has been promoted linked with government policies. However, to strengthen the private sector’s leading role, it is desirable to promote the social economy comprehensively by the region’s needs, not focusing on individual projects. It is required to expand a consensus on the need for promoting the social economy in agriculture and rural communities. To promote the social economy by reflecting diverse features of the community, the roles of the local government and
the private sector in the community are important. It is necessary to draw and implement
tasks for the development of the social economy suitable for rural circumstances. Due
to the rapid aging and depopulation in rural areas, it is the most urgent task to find
manpower for vitalizing the social economy. This manpower can be trained in the
region or supplied from outside, but it may be difficult for many rural areas to secure
the manpower without outside supply. In Korea, because intermediary support
organizations are established and run linked with individual government policies,
cooperation among these organizations in a region is not smooth. It is necessary to
support creating an integrated regional network of the social economy, and integrate
individual intermediary support organizations or expand mutual cooperation among
them.
A Study on Improving Staple Grain Policy in Response to Consumption Changes

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Background & Purpose

The Korean staple grain industry is faced with a decline in food consumption, a high import dependence on grains other than rice, overproduction of rice, and overconcentration of agricultural resources and policies only on rice. The purpose of this study is to develop a staple grain policy plan for a balanced grain crop production and consumption system through a close analysis of the problems faced by the current Korean staple grain industry. In particular, the recent easing of the decline in rice consumption is critical for establishing not only rice price stabilization measures at harvest period in the short term but also the overall rice supply and demand policy in the long term. Hence it is necessary to analyze whether the easing in rice consumption decline is temporary or whether the trend is changed.

The purpose of this study is to derive policy measures to overcome the problem of excess rice supply and overconcentration of agricultural resources and government’s policy on rice. To achieve this goal, this study analyzed the staple grain production condition, rice consumption trend and behavior change.

Methodology

In order to clarify the cause of rice oversupply structure, this study divided the
domestic staple grain industry into production side and consumption side. On the production side, the profitability of competing crops such as corn, soybeans, and potatoes, and the cultivation environment in rural areas were analyzed to examine the possibility of conversion of rice to other crops. Therefore, even though wheat and barley belong to major grain crops in Korea, they are excluded from the analysis because they are winter crops which do not compete with rice cultivation.

On the demand side, the study focused on rice consumption behavior analysis. In addition, since rice consumption is very different for food and processing, analysis was carried out separately.

The main research methods used in this study are micro consumer data analysis using the econometric analysis method, consumer questionnaire survey, and foreign case analysis.

**Results and Implication**

The causes of persistence of rice farming in rice paddies were analyzed to be the lack of labor force due to the aging of farmers, the high rate of mechanization in rice production, and the more stable rice prices and income than other crops. Therefore, the basic direction of the staple grain policy should be set up to solve the problem of over-support only on rice by strengthening financial and policy support for rice-competing crops. Specifically, it is necessary to eliminate the linkage between rice production and the variable direct payment. And fixed direct payments need to be integrated into one system so that there is no payment difference between paddy rice and other field crops. In addition to the efforts to achieve the original target area, the follow-up measures of the rice cultivation area reduction project which is implemented by next year should be prepared so that cultivation of the converted crops can be continued.

The analysis of statistics on rice consumption, the trend of rice consumption in Japan and Taiwan, and the estimation result of the rice demand function using econometric methodology suggest that decline in rice consumption has not been eased yet. In addition, the expected population aging may increase the rice consumption, but
the effect is expected to be very limited, since the generation effect is larger than the net aging effect in the rice consumption. Therefore, it is necessary to establish and implement a staple grain supply policy based on the assumption that the excess rice supply structure will continue in the future as rice consumption continues to decrease.

The consumption of rice for processing increased by more than 3% per year, which is considered to play a role in mitigating the decline in overall consumption of rice. Particularly, consumption through lunch box, processed rice, rice porridge increased greatly. Therefore, in order to cope with the demand for increasing consumption in rice processing industries, it is necessary to strengthen supports of R&D for appropriate varieties and quality.

Japan and Taiwan also have responded to the overproduction of rice and implemented a production adjustment policy from early on and had some achievements such as balancing rice supply and demand. However, due to the continuing decline in rice consumption, the area subject to production adjustment has been continuously increasing, which has exposed the limitation of increasing government burden. Therefore, production adjustment policy, which requires government finances, should be used as a temporary policy for the transition period as it can lead to an increase in financial burden.
The Current State of and Policy Tasks for Women Farmers' Farming Activities

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Background & Purpose of Research

In the past, most farmers were men. Most women were considered male farmers’ assistants or unpaid family workers in agricultural production activities. However, the decrease in rural population and the shortage of agricultural manpower are increasing women’s agricultural production activities. As a simple example, the proportion of female farmers’ labor input into agriculture production activity accounts for 30.0% as a family labor force, 72.7% as an employed labor force, and 60.4% as a way of helping. The role of female farmers in agricultural employment surpasses that of male farmers.

The role of women farmers is expected to increase. This is because the form of farming is shifting from the rice farming, which depends on male labor or machinery, to crops such as vegetables, fruit, and flowers that depend on the female labor force (Kang, 2008).

Based on the awareness of the role of women farmers, the government also established the Support of Female Farmers and Fishermen Act in 2001 and establishes a basic plan for fostering women farmers every 5 years. Although the Basic Plan for the Promotion of Women Farmers contains policies in the area of life that women farmers face, there are a number of opinions that women farmers do not feel high effectiveness of the policies, except for changes in welfare areas. In particular, the most urgent task
for women farmers was to reduce the burden of labor (31.3%).

The countermeasures include the development of women-friendly farming equipment and the revitalization of the use of agricultural machinery rental business, but there are a number of evaluations that do not seem to have had any substantial effect. In order to analyze whether the development policy of women-friendly agricultural machinery and the promotion of rental business utilization policy substantially mitigate the burdens of labor of female farmers, an analysis of the actual situation of farming should be preceded, including agricultural labor forms provided by women farmers.

In addition, since the demand for policy changes according to the age group, a customized policy that reflects the characteristics of the policy target is needed. Studies that reflect the population and sociological characteristics of female farmers are needed.

Therefore, this study analyzes the actual conditions of farming activities and changes in the needs of women farmers from various perspectives. Based on the results of the analysis, we analyze the deficiencies of the current policies and systems.

It presents effective policy tasks considering the population, social and economic characteristics and needs of women farmers and presents policies necessary for women farmers to continue agriculture as major manpower in agriculture.

**Research Scope and Method**

The research methods used were domestic and overseas literature surveys, statistical data analysis, quantitative modeling and its analysis, and interview surveys. We reviewed the issues and proposals related to the farming activities of women farmers through domestic and foreign literature. The statistical data were analyzed using characteristics of farmers’ economic survey, agricultural census, economically active population survey, and female farmers survey.

The characteristics of the policy subjects analyzed by statistical data are tested whether it is statistically valid and the effect of socioeconomic factors on the farming activities of female farmers is analyzed. This analysis is important in that it can provide a basis for elaborating the female farmers’ labor burden reduction policy, which is
highly needed by women farmers.

Based on the results of the analysis, we set up classification reference points for each generation of female farmers and analyzed the policy demand of female farmers for each generation based on the reference points, and then presented the policy tasks. In this study, in order to supplement the areas not included in the quantitative analysis, interviews were conducted with the concerned persons.

**Research Content and Main Results**

In Chapter 1, the background and purpose of the research and the literature related to the farming activities of women farmers were reviewed. After classifying the research of women farmers in the first place, we re-categorized the research related to the farming activities and mentioned limitations and issues of the previous research. Policies that respond to the farming activities of women farmers exist in the policy of women farmers, but it is difficult to find related basic research.

In this study, we analyze the farming activities of women farmers in detail and analyze the roles and positions of women farmers in farming activities. For the analysis, we used the statistics of Statistics Korea, the Crop Production Survey, the Economically Active Population Survey, the survey data on the actual condition of female farmers, and previous research results.

Although the agricultural production scale and the proportion of agricultural employment are steadily declining, the participation rate of female farmers in economic activity remains high and their share of farming significantly increased in 2013 compared to 2008. In addition, as the ages increase, the proportion of women farmers in charge of farming is increasing, and in the case of vegetables, fruits, and flowers the proportion of women farmers in charge of farming is larger than that of other crops. The role of these women farmers is expected to increase gradually as rices are converted into vegetables, fruits and flowers.

In Chapter 3, female farmers’ policies were analyzed by using policy data. The basic plan for fostering female farmers and fishermen is established every five years and has
been implemented since 2001. Currently the fourth basic plan is being implemented. The basic plan for fostering female farmers and fishermen is established at the central government unit, and based on the basic plan, local governments also implement and check the basic plan and the annual plan every five years depending on the local situation. In Chapter 3, basic plans for fostering female farmers and local governments and their implementation plans were analyzed through relevant data and interviews with related persons.

Chapter 4 analyzes the actual conditions and characteristics of farming activities of women farmers. The actual situation of farming activities of female farmers was analyzed through related statistical data and interviews with female farmers. The actual conditions of farming activities of female farmers were analyzed according to the characteristics of households with female farmers, the ages of female farmers and the characteristics of the items engaged. The items engaged in by women farmers vary according to the classification criteria. The lower the age, the higher the off-farm income than the agricultural income. The higher the age, the smaller the proportion of the off-farm income. When analyzed in more detail by labor input time, the absolute labor input time of female farmers is highest in the vegetable farm households, and the annual labor input time per household is longest for flowers, followed by fruit, vegetable, and livestock. In addition, the labor input time of female farmers varied according to their ages.

In Chapter 5, quantitative analysis using an econometrics model is used to examine whether the factors that can characterize the farming activities of female farmers analyzed by descriptive statistics in the previous chapter affect statistically effective levels of female farmers’ farming activities. Particularly, not simply dividing age groups into 10-year or 5-year units, we categorized the age groups that can characterize the farming activities of women farmers through the analysis result. After analyzing the current policies and policy needs in Chapter 6, the policy task was presented in Chapter 7. Particularly, quantitative analysis and qualitative analysis results obtained from interviews of female farmers were supplemented by discussions.
A Study on Integrated Marketing Organizations for Horticultural Products

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Background of Research

The purpose of the government’s agricultural shipping-point marketing policies is to increase the income of farm households and induce stable agricultural management by increasing the bargaining power through standardization and specialization and securing a stable supply system. For this purpose, the government’s policies for shipping-point marketing since the 1990s have been to organize small-scale farmers, to scale up agricultural products of organized farmers, and to uniformize the quality.

The government had implemented the policies to support the agricultural product processing centers (APCs) and expand the joint shipment function so as to scale up the agricultural processing organizations until the early 2000s with the National Agricultural Cooperative Federation (NACF) as its center. However, as the performance of organization did not stand out much, the government introduced the concept of integrated marketing in 2011 and has established and operated integrated marketing organizations (hereinafter referred to as “IMOs”) in earnest.

The IMOs developed by the government contributed to creating added values and improving the producers’ income by increasing the competitiveness of the production and sales business. However, the agricultural distribution and sales business showed a severe polarization as there were more IMOs without expertise in the sales business than those with expertise depending on product items and regional characteristics.
The purpose of this research is to identify the current status of APC policies and the operation status of the IMO, look into problems by analyzing the actual condition of the IMO, and suggest future policy directions and tasks for the IMO.

Methods of Research

Related literature and policy data were reviewed and a survey of policy-makers and experts was conducted. The present status and operational status of the IMO was analyzed on the basis of the aT data that evaluates the shipping-point marketing promotion project every year. Since it was the evaluation data, the source data was acquired and reconstructed to obtain necessary results for the research.

Changes in the market structure and price impact before and after introduction of the IMO were analyzed using daily prices in the wholesale market. In addition, the cost function was used to derive an optimum scale of the IMO, and a commissioned research was conducted to obtain specific results.

A conference of experts and policy-makers was held to evaluate the actual status of the IMO; factors in activating the IMO were surveyed through visits, phone calls and internet search; and questionnaire surveys were conducted to identify problems and solutions.

Transition Process and Policy Projects of the Agricultural Product Processing Center (APC)

The APCs in Korea were significantly influenced as Seoul Garak-dong market, the largest wholesale market in Korea, was opened in 1985 and large-scale distribution companies were established along with the opening of the distribution service market in 1996.

As the distribution organizations had become bigger for farmers to ship individually, it was necessary to organize and scale up farmers in order to increase the bargaining power for the farmers, which resulted in introduction of the concept of integrated marketing to professionally sell agricultural products and establishment of integrated marketing organizations in earnest in 2012.
The representative of the policy projects for the IMO is the shipping-point marketing promotion project, which provides supports differently through evaluation every year. It was attempted in 2016 to unify and integrate the policy projects for shipping-point marketing, which had been implemented dispersedly, into a comprehensive horticultural industry plan, but it only ended up causing confusion with the existing fruit industry development plan and comprehensive shipping-point marketing plan. Furthermore, no feasible comprehensive horticultural industry plan has been established, as it is recognized as a temporary plan to get government funding.

**Evaluation of the Current Condition of the Integrated Marketing Organization (IMO)**

Since 2012, the number of IMOs was reduced to 116 from 165, of which the larger ones increased from 42 to 69 and the medium/small ones decreased from 123 to 47. On the other hand, the amount handled by the IMOs increased from 3,738 billion won in 2012 to 3,923.3 billion won in 2017, implying that the IMOs have been scaled up.

The number of participating organizations in the IMO is 3.5 per IMO, while that of the agricultural cooperatives is 3.9 and that of the agricultural corporations 2.2, which is less. The overall unit price traded by the IMO is 1,921 won per 1kg, while that of the agricultural cooperatives is 1,874 won and that of the agricultural corporation 2,129 won. It is shown that, of all corporations in the IMOs, the unit price traded by cooperative joint business corporations is the highest.

The organization handling rate of the IMO had steadily increased since 2012 but recently it has been stagnating. As of 2017, there are 3.4 professional workers per IMO, and the amount handled by a professional worker is 13.43 billion won for regional commodity organizations, which is the highest and the one handled by cooperative joint business corporations is 11.37 billion won. On average, the number of professional workers in a regional commodity organization and a cooperative joint business corporation is relatively small.
▶ Shipment by the IMO has been decreasing since 2012 in the wholesale market but the number of large retailers has been increasing, which works as a positive factor. However, as the percentage of fixed and negotiated price sale in the wholesale markets is very low, it is necessary to take measures to increase the percentage of fixed and negotiated price sale in order to increase the bargaining power in trading.

▶ With respect to the actual condition of cooperative joint business corporations, which are municipal organizations, and that of municipal united business groups, the former appears to be more competitive than the latter in all areas such as the amount and quantity of trading per organization, the organized amount and quantity of trading, the number of professional workers per organization, and the per capita trading amount.

**Current Operating Condition of the Integrated Marketing Organization and Its Participating Organizations**

▶ Since the IMO was introduced in earnest, changes in the price structure have appeared mostly in major items. The more distinctive the major producing areas are, the more quantities the IMO handles, the higher the seasonality is, and the higher the brand awareness is, the higher the transaction volume shipped from the IMO than general shipment.

▶ The economic index of the average scale of the IMO is smaller than 1, so it is necessary to expand its business in order to achieve an optimal scale, 1.66 times the average volume traded by a cooperative joint business corporation and 1.80 times the municipal united business group. The average transaction volume of the cooperative joint business corporation should be expanded 1.34 times and that of the municipal united business group 1.35 times.

▶ The result of the questionnaire survey for IMOs shows that: the satisfaction level was the highest for shipment to large distributors; the shipment to the wholesale market was high in the auction transaction but the need for fixed and negotiated price sale was also high at 71.4%; and the participating organizations had a high level of
satisfaction for shipment to the IMO and wanted to expand the percentage of shipment, which is expected to work as a positive factor in improving the bargaining power and scale-up of the IMO.

- The percentage of the participating organizations’ shipment to the IMO was 39.8∼44.7%, in which the percentage of the commissioned sales (simple book-keeping) was 33.6∼44.6%, so the actual percentage of the shipment to the IMO accounted for 22.1∼29.7% only.

- In order to invigorate the IMO, the shipment ratio of the participating organizations should be increased at least to 59.4%, and the minimum commission should be around 2.3% and the minimum sales 33.65 billion won to enhance its competitiveness. In other words, it is important to increase the shipment ratio of participating organizations, increase the sales commissions to a realistic level, and to continue scaling up, and thereby to increase the competitiveness of the IMO.

- Factors in invigorating the IMO are “active participation of participating organizations” and “support of local governments”, whereas factors of competitiveness actually held by the IMO are “securing of local producers’ organizations” and “active participation of participating organizations”. This implies that the support of the local governments is at the bottom in real competitiveness, so the effective support of the local governments is needed.

- The result of the evaluation of IMOs shows that the growth rate indicator of large organizations was highly contradictory. They tended to have high organization scores, but it was difficult to apply in reality. Therefore, it is necessary for the IMO to focus on training a professional workforce to increase its competitiveness.

- The optimal unit of the integrated marketing organization is the municipality, because the municipal unit has more advantages in terms of quality control and operation management for the participating organizations than the metropolitan or national units, and the brand image and consumer awareness are also much higher in the municipal unit.

Factors in Activating the Integrated Marketing Organization through a Study of Domestic/Overseas Cases

Through a study of domestic/overseas cases, factors in activating the IMO were
derived. Seventy-nine (79) cases of IMOs in Korea were studied, to derive 13 factors in activating the IMOs, based on which the following three tasks were identified as most urgent.

▶ First, marketing capability should be enhanced to increase the management stability of the IMO. This task involves the factors like “securing of diverse markets”, “differentiation of marketing and brands”, “efforts to expand exports” and “differentiation of marketing strategies”. When markets become more diverse, including not only the existing wholesale markets but also large retailers, food companies, restaurants, and export and processing companies, it will be possible to sell bigger volumes, to increase the bargaining power, and thereby to enable organization of farmers for shipping-point marketing.

▶ Second, it is important to systematically manage the organizations participating in the IMO to increase the efficiency of its operation. In order to increase the competitiveness and stability of the IMO, it is necessary to give accurate incentives and penalties to participating organizations and local producer organizations. The biggest advantage of integration is to establish a sales strategy to sell planned quantities of the same quality. To this end, differentiated cultivation technology should be provided for systematic organization management, continued quality management should be ensured, and communication should be based on mutual trust.

▶ Third, the IMOs should actively participate in the government policies and government-funded projects. As the revenue of the IMO is fees, which are often returned at the year-end, it is important to make the most of the government funding.

▶ Italy is directly involved in producer members’ production, shipment, and adjustment of supply and demand, and organizes the IMOs through consultation with union members, management of yields, strict quality inspection, and joint accounting. Japan has secured a stable supply system from the producing districts through the contracted cultivation and restricted the main agent of the government policy businesses to a shipping organization rather than individuals, thereby ensuring the unification of policy businesses.
Improvement of Management to Activate the Integrated Marketing Organization

- Improvement of management is required to activate the IMO, which can be achieved through strengthening of the management stability and enhancement of the operation efficiency.

- In order to strengthen the management stability of the IMO, a system to scale up the organization should be prepared, its commissions should be made realistic, and a revenue structure should be created.

- Participating organizations that ship to the IMO get funding for joint screening fees and packing expenses. Therefore, it is necessary to consider differentiated funding support for participating organizations that are contracted to ship more than 50% of the trading amount. When they submit their accounting data by simple bookkeeping method, they get 3 points deducted, which is small and thus rarely effective. Therefore, it is necessary to increase the points deducted and lower the standard performance, to improve the growth rate realistically.

- The revenue of the IMO consists only of the commissions from the shipments and sales by the participating organizations. However, ordinary farmers and participating organizations are very repulsive against the commissions they have to pay to the IMO, causing to lower the revenue of the IMO and thus making it difficult to find new markets or attract investments. So, it is necessary to stipulate and mandate in the standard articles of association that the average commission of the IMOs across the nation should be the minimum commission, when a cooperative joint business corporation is established.

- With respect to the creation of revenue structure for the IMO, it is necessary to strengthen management stability through collaboration with the local food producers and implementation of the integrated marketing businesses such as agricultural manpower supply projects, joint purchase of production materials and bulk rental projects for agricultural pallets.

- It is necessary to enhance the bargaining power using various trading systems to
improve operational efficiency, establish a cooperation system with participating organizations, secure professional manpower, and improve human resource recruitment.

▶ In order to increase the bargaining power of the IMO, various trading systems should be utilized. Especially when the percentage of the agricultural organizations’ shipment to the wholesale market is more than 50%, it is necessary to reduce the ratio of auction trading but increase fixed and negotiated price sale. To this end, it is necessary to introduce not only an incentive scheme, which gives incentives based on the ratio of transaction volume of fixed and negotiated price sale in the evaluation indexes for the shipping-point marketing promotion business, but a penalty scheme as well.

▶ In order to develop a smooth cooperative relationship among participating farmers, participating organizations, and the IMO, an efficient decision-making system is required to ensure information exchange through active communications, provide services to the participating farmers, and prevent conflicts among them.

▶ In order to enhance the operational efficiency of the IMO, it is important to secure professional manpower. To this end, it is necessary to increase the score allocated for securing professional manpower to reflect the expertise of the organizations participating in the IMO (such as obtaining the qualification for agricultural product quality control and the license for crop cultivation technology), acknowledge the expertise for various training programs for marketing, and secure and maintain the IMO’s expertise by including the hours of training in the evaluation indexes.

▶ At the time of recruitment, it is necessary for the National Agricultural Cooperative Federation (NACF) to manage and support the recruitment of cooperative joint business corporations as well, so that the corporations may secure good manpower through the announcement at the NACF level only. This will also give pride to the recruited manpower that they are hired through open recruitment, which will help them maintain a smooth relationship with participating agricultural cooperatives and be free of pressure from the outside.
Policy Direction and Tasks for the Integrated Marketing Organization

Future policy direction of the IMO should be binary (2-track). First of all, the goal of IMO policy should be set as income generation from the economy of scaled-up mass production to increase competitiveness of the local agricultural regions and as income increase for small farmers who cannot be scaled up at municipal units.

When the goal is to raise the market bargaining power and increase the economic efficiency by focusing on the items that can be mass-produced in major producing areas, shipping-point marketing policies should be implemented with the municipal (item-wise) IMOs as the center.

On the other hand, when the goal is to increase the income of small-scale farmers centering on the items for which there is no municipal IMO or which are not traded by the municipal IMOs, or on the items of which production cannot be scaled up at the municipal level, the integrated marketing business should be promoted by the provincial IMOs with Nonghyup Agribusiness Group Inc. at its center.
A policy task for the IMO is to improve and develop the evaluation indexes of the IMO in accordance with the policy goal. In order to expand the scale of the IMO, it is necessary to resolve the issue of reverse discrimination of growth rate. To this end, it is necessary to allocate different scores according to the scale, raise the score for the marketing performance to increase the effectiveness, and allocate a new score to diversity. The score for organization is 55, which is very high but not realistic and thus needs to be rectified. It is necessary to raise the score for specialization to focus on securing the professional manpower, and include the manpower of the participating organizations in the professional manpower index to evaluate them as one group.

Consistency in the IMO policies is required. When wholesale corporations in the public wholesale market are evaluated, the performance of fixed and negotiated price sale is used as an evaluation index and when the shipping-point marketing promotion project is evaluated, the performance of fixed and negotiated price sale is also evaluated as the incentive. Therefore, it is necessary to evaluate the wholesale corporations and the IMOs based on the same evaluation indexes.

While the government focuses on funding the comprehensive horticulture industry development plan and the fruit-tree FTA development project in order to support shipping-point marketing promotion, the departments in charge of the plan and the project employ different funding/support systems, though both of them are supporting the same horticultural products (fruits and vegetables). This causes waste of time and expenses for the IMOs in planning their business projects. Therefore, a system is needed to enable efficient management and support at the same time, by unifying work procedures and policies for supports.

It is necessary to improve the use of the funds for shipping-point marketing promotion. It is necessary to support the operating funds for three years after an IMO is selected for funding so as to strengthen its marketing capability, secure professional manpower, and enhance the management and operation efficiency. As those who are eligible for funding for “the agricultural products logistics facility standardization project”, a project supported by the local government, are limited to the agricultural
cooperatives only, it is necessary to extend the eligibility to the IMOs under the agricultural corporations and provide comprehensive supports. Also, the support of the local governments are often for individual farmers, and therefore it is necessary to unify the targets of the support as the IMO in order to encourage farmers to voluntarily participate in the integrated marketing.

▶ It is necessary to build a statistic system for the IMOs, in order to ensure efficient management of the IMOs and systematically manage shipping and delivery within the legal boundary of privacy protection, by linking the NACF computer system and aT through the consultation with relevant organizations and agencies.

▶ It is necessary to progressively incorporate the municipal united business group. When the IMO was introduced in 2012, the municipal united business group was to be converted to the cooperative joint business corporation, but the incorporation has been delayed indefinitely due to the commencement of the NACF’s supply and marketing business and the insufficiency of participating organizations. However, in order for member agricultural unions of the municipal united business groups under the NACF Financial Holding Company to voluntarily participate in their business projects, it is inevitable for the municipal united business groups to be incorporated into the cooperative joint business corporations.
Changes in the Supply and Demand Environment of Major Vegetables and Countermeasures

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Background of Research

Recently the supply and demand of vegetables have been affected by more various changes in production, distribution, consumption, import and export, the meteorological environment, etc. than in the past. Therefore, it is needed to closely analyze how each factor influences the supply, demand, and prices of vegetables, and to set up policies for responding to changes in the supply and demand environment of vegetables.

In Korea, the conclusion of FTAs has expanded the import of vegetables including kimchi made in China, and frequent abnormal climate phenomena due to global warming have increased the instability of the supply and demand of vegetables. For these reasons, it has become difficult to maintain stable production of vegetables. Thus, it is necessary to examine the current changes in the meteorological environment, production, import, consumption patterns, distribution, the processing environment, etc. which affect the supply and demand of major vegetables, and to present policies that can respond to these changes.

Method of Research

This study examined the current policy of the Supply and Demand Stabilization Project by utilizing previous studies and policy materials on the supply and demand of vegetables, and conducted a survey for experts and policymakers (the central and local
governments, agricultural cooperatives, local traders, etc.) related to the Project. Regression analysis and time series analysis were also used.

First, the survey on the Vegetable Supply and Demand Stabilization Project for people related to the Project was utilized to identify the current status and problems of the Project, analyze the importance and satisfaction levels by using the IPA technique, and draw development plans.

Second, for statistical and econometric analysis, this study analyzed the effect of the characteristics of price fluctuations of major vegetables and kimchi imports from China on major domestic vegetables by utilizing a time series model.

Concretely, this study analyzed whether a particular shock on time series data increases volatility in a certain period through ARCH effects designed by Engle(1982), and analyzed the relation among vegetable prices, domestic production, and kimchi and vegetable imports from China by using the VAR model and the SVAR model.

**Effect of Changes in the Meteorological Environment on the Production and Import of Vegetables**

From the result of analysis of the impact of meteorological and import changes on vegetable production and price fluctuations, the following implications were drawn. The meteorological environment decreased yields at a statistically significant level. Recently, a period with the highest price volatility has been concentrated in spring (drought, high temperature), summer, and fall (localized heavy rain, typhoons). Therefore, it is required to establish the foundation of vegetable production that can respond to changes in the meteorological environment in these periods. According to the result of analysis of changes in domestic vegetable acreage and prices due to a rise in kimchi imports, the increased import of kimchi reduced the production base of domestic vegetables.

**Changes in the Environment of Vegetable Consumption**

The environment of vegetable consumption is changing continually. Consumers
who mainly purchased raw food products in the past have come to prefer semi-processed products including salted cabbage, washed radishes and carrots, and chili powder. Restaurants and large users have increased the proportion of their use of imported vegetables.

**Evaluation of and Future Tasks for the Supply and Demand Stabilization Project**

From the evaluation of the major means of the government’s Supply and Demand Stabilization Project (contract cultivation, government procurement and stockpiling, and market isolation projects) and an analysis of the survey result of the importance of and satisfaction with the Project, the following implications can be derived.

First, as the government’s means of market intervention, government procurement and stockpiling and market isolation projects, are continuing, it is urgent to establish plans to enhance the percentage of contract cultivation by agricultural cooperatives.

Second, the government procurement and stockpiling and market isolation projects should target producers participating in contract cultivation only, because the projects are not very effective in increasing farm household income and especially the market isolation project can cause social controversy.

Third, the evaluation of the importance of and satisfaction with the supply and demand policy using the IPA technique shows that prior control of cultivation area, the agricultural outlook, and the contract cultivation project are important.

**Short-Term and Medium- and Long-Term Policy Tasks for Responding to Changes in the Supply and Demand Environment of Major Vegetables**

Through the above research results, short-term and medium- and long-term policy tasks due to the changes in the supply and demand environment of major vegetables can be summarized as follows. In the production sector, it is necessary to respond to changes
in the meteorological environment by preparing measures to improve the production base and increase the percentage of contract cultivation of producer groups such as agricultural cooperatives in the short term. In the medium and long term, it is required to stably conduct contract cultivation and produce the optimal volume with vegetable production complexes that have the production base as the center. In the processing and distribution sectors, it is needed to respond to the expansion of semi-processed vegetables including salted cabbage and washed radishes and carrots by establishing plans to build a safety and quality standardization system. Also, it is necessary to minimize vegetable price fluctuations by linking the volume of contract cultivation and fixed and negotiated price sale. In the consumption and import sectors, it is required to lay the foundation for direct transactions based on contract cultivation between producer groups and end users, and to apply the positive list system (PLS) to imported vegetables and kimchi, monitoring the establishment of the PLS for domestic vegetables. In the policy sector, it is needed to lay the foundation for enabling producer groups such as agricultural cooperatives to convert the government’s Supply and Demand Stabilization Project into the method of contract cultivation of vegetables. At the same time, it is necessary to connect vegetable outlook information with the Project through accurate forecasting combined with scientific technique.
Policy Tasks for the Stable Growth of Small and Medium Sized Food Manufacturers

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Background and Purpose of Research

Recently, financial difficulty which small sized businesses suffered was reported frequently. The rate of food manufacturers closed against those started for the last five years is higher than the average of total manufacturers. It is estimated that small sized food manufacturers will have a difficulty due to deterioration of financial structure. The purpose of this study is to find policy tasks for stable growth of small and medium sized food manufacturers based on research and analysis of management improvement factors such as cooperation and collaboration by understanding the real condition of management among small and medium sized food manufacturers playing an important role in terms of influence on agriculture, forestry and fisheries, employment and the regional economy.

Research Method

This study mainly covers small sized food manufacturers that account for 66.7 percent of total workers engaging in food manufacturing and 40.1 percent of sales. This study analyzed the current state of operation according to characteristics of business enterprises and compared productivity according to sizes of small and medium sized food manufacturers by collecting statistical raw data from Statistics Korea, the Ministry
of SMEs and Startups and Science & Technology Policy Institute. Growth accounting analysis, DEA analysis and regression analysis were conducted to find out growth factors, productivity change and management performance determinants of small and medium sized food manufacturers. 85 small and medium sized food manufacturers were surveyed to find out awareness of management improvement and preference for methods of management improvement such as cooperation and collaboration. An in-depth survey was conducted to analyze cases of management improvement, cooperation and collaboration by visiting five small and medium sized food manufacturers in three types.

**Main Findings**

Between 2010 and 2016, the proportion of the number of workers engaging in food manufacturing and that of its sales in manufacturing increased to 8.4% and 6.4% respectively. Nonetheless, budget on the food industry in the Ministry of Agriculture, Food and Rural Affairs has been reduced, especially budget on strengthening of competitiveness of small and medium sized food manufacturers. On the other hand, budget for the Ministry of SMEs and Startups in charge of small and medium sized businesses policy has increased slightly but cooperation between organizations or supports by ministries and offices are unsatisfactory.

Business to business accounts for a great part in a market for small and medium sized food manufacturers. Nonetheless, only 21 percent of food manufacturers do consignment transaction and most food manufacturers do business centering on simple transaction. With the labor force working in small and medium sized food manufacturers, women are more than men and education level is low and sales and production positions lack workforce. Only 40 percent of small sized food manufacturers make facilities investment. Facilities investment is limited to maintenance and expansion of existing facilities. With small sized food manufacturers, innovation activities such as R&D are insufficient, especially process innovation. Only 10 percent or less of food manufacturers have cooperated with other businesses or organizations when doing innovation activities.
Recently, real production growth of small and medium sized food manufacturers has been sluggish, which is caused by insufficient capital investment or work force and poor total factor productivity. With small sized food manufacturers, total factor productivity is low. With medium sized food manufacturers, the increase rate of total factor productivity is declining. According to analysis of production efficiency, the productivity gap among business enterprises is increasing. It was found that assets size, capital equipment ratio, degree of cooperation and collaboration, R&D activities and advertising cost have a positive (+) influence on business performance of each food manufacturer (sales per worker) while leverage (debt ratio) and number of the unemployed have a negative (-) influence on business performance of each food manufacturer.

In a survey, small sized food manufacturers said that they focus on an increase in sales for business improvement and pointed out excessive competition, depression, sluggish growth, instable transaction and financial risk as factors of instable business. Small sized food manufacturers thought of marketing capability improvement or production capability improvement (facility investment) as important factors of business improvement. 61.2 percent of food manufacturers have had no experience of cooperation and collaboration. Food manufacturers said that they want to collaborate with medium sized businesses and large businesses. 71.7 percent of food manufacturers want cooperation and collaboration and they prefer joint marketing and technical development. Food manufacturers surveyed said that they have a difficulty in finding partners (lack of information) and financing when promoting cooperation and collaboration. Food manufacturers surveyed said that capabilities of production, processing and sale were improved through government’s support. Food manufacturers surveyed want capability of technical development as well as capability of sale to be improved.

Agricultural corporation Saessak and general manufacturing corporation GangDong O Cake are an example of improving business through supply chain management (SCM) centering on small sized businesses. Saessak and GangDong O Cake secured high quality ingredients such as oilseed crops and Korean wheat through contract cultivation. Improved business was primarily caused by enhanced processing quality through
unification of varieties of ingredients and effort to develop processing technology that can enhance safety and taste of products. Research and development were conducted through active cooperation with colleges and research institutes. Dongnebangne Network and Eoggaedongmu Cooperative which are associations of small sized food manufacturers cooperate with medium and large sized business enterprises. Dongnebangne Network that is an association of raw rice wine breweries established standardized production technique and allied brands with the help of traditional alcoholic beverage manufacturers that are medium sized businesses and traditional alcoholic beverage manufacturers expect to secure a distribution network of traditional alcoholic beverage. Eoggaedongmu Cooperative that was formed centering on bean curd benefited from allied brand development and marketing provided by a large scale distributor. Eoggaedongmu Cooperative has developed through joint purchase of ingredients, joint operation of logistics facilities, delivery, reduction of logistics and management expenses, expansion of market and development of various products. Love & Good Deed Corp. is a good example which shows that comprehensive collaboration led by distribution and meal service can improve ecology of the food industry significantly.

In order for small and medium sized food manufacturers to grow stably, it is necessary to build social infrastructure such as alleviation of excessive competition, promotion of cooperation and collaboration among businesses, improvement in ability to cope with the future and strengthening of links of policy support so that individual businesses' capability can be strengthened and total factor productivity can be enhanced. In order for capability of small and medium sized food manufacturers to be strengthened, it is necessary to include secondary process manufacturers in businesses entitled to the credit guarantee for farmers and fishermen and invigorate agrifood cloud funding during founding and at the time of introduction of new business. It is desirable to expand R&BD which promotes research and business development at the same time and supplement a standard which recognizes characteristics of the agrifood field in the agrifood venture business technology evaluation system. It is necessary to provide information on local buyers and overseas market issues through a database and increase
an opportunity to talk with prospective buyers online and offline to expand the market. It is advisable to expand an opportunity to seek workers jointly through expositions (exhibitions) and a platform in the field of food to alleviate manpower shortage of small and medium sized businesses.

There is a way that gives special treatment to or supports producer organizations to manage business risk and alleviate excessive competition. It is advisable to expand purchase performance guarantee insurance through which small sized food manufacturers can purchase agricultural products by credit and invigorate transaction and use of used machine equipment by building a distribution platform. Cooperation and collaboration between business enterprises make supply chain management (SCM) efficient through vertical and horizontal combination and bring external effect by exchange, learning and accumulation of information and knowledge (knowhow), namely mutual risk sharing. It is advisable to expand agriculture, industry and commerce combining the small and medium sized business promotion project to a network based cooperation and collaboration system and discover various cooperation and collaboration models and support construction of an online/offline platform and cultivation of organizations to promote cooperation (coordinators) to seek partners.

It is necessary to focus on improvement and innovation of process control to strengthen small and medium sized food manufacturers’ ability to cope with the future and promote the introduction of smart factories step by step. It is advisable to build a database for supporting business enterprises and provide guidance on policy support projects in order to construct links between ministries and offices. It is desirable to make use of industrial clusters such as specialized industrial complexes of rural areas as the base for consulting, education and smartization and increase one-stop support service centering on agrifood venture founding support centers.
International Development Cooperation Strategy in Agriculture and Forestry Sectors for Focus Countries

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Background & Purpose of Research

This is the first year report of multi-year research. It is to provide policy suggestions for enhancing ODA effectiveness in agriculture and forestry sectors, especially through focusing upon the private sector’s roles, and applying analytical tools of value chains and stakeholders. The main purpose of the research is, therefore, to provide in-depth strategic suggestions by analyzing current situations and challenges of carefully selected focus countries, and digging out key development cooperation areas.

Research Method

The first year, 2018, is devoted to developing research methodologies for the next years, and, from the second year, it is planned to establish strategic policy directions for the selected focus countries.

With a comprehensive review of literature related with the research topics, statistical analysis process has been implemented to select focus countries. Out of databases, for instance, FAOSTAT, raw data on 143 developing countries were selected, weighted and aggregated. AHP analysis was adopted to decide weight of each category and indicator.

Experts from domestic and international—Bangladesh and Azerbaijan—research
institutes were requested to undertake researches on areas of cooperation and value chains. Face-to-face interviews were also used for in-depth understanding of situations of agriculture and forestry sectors of Paraguay and Bangladesh.

**Results and Implications**

By utilizing data from FAOSTAT of FAO, Databank of the World Bank, and others, related statistics were gathered on four categories, government policy, areas in which development cooperation is required, readiness of cooperation, and business conditions. AHP analysis produced weights for categories and indicators, and ultimately lists of focus countries were derived on the agriculture sector, forestry sector, and agriculture–forestry sector.

For developing value chain analysis of the agricultural sector of developing countries, conceptual definition, points of difference from supply chain, methodology, analytical framework, and cases of USAID and the World Bank were reviewed and introduced. UNIDO’s five steps for value chain analysis were adopted to apply to agriculture and forestry sectors of developing countries: identification of objects, mapping, cost and benefit analysis, analysis on structural and dynamic factors, and strategy establishment.

With regard to stakeholder analysis, methodological cases of British ODA and DFID, and KOICA were provided. In applying to the agriculture and forestry sector analysis, it is suggested to proceed the following phases: understanding project types and features, identifying and listing key stakeholders, grouping stakeholders and grasping their interests, checking possibilities of cooperation from stakeholders and their capacities, and forming a matrix to indicate influence and importance of stakeholders.

Private sector development, PSD, is an emerging area for sustainable development cooperation and creation of new sources of fund. The level of support is classified as upper-stream (macro-level), mid-stream, and down-stream (micro-level), whereas areas of support are investment environment, infrastructure, and productive capacity. This research estimated current ODA budget assigned for PSD, which is 67 million USD in 2016 in terms of support level, and 81 million USD in terms of support areas; however,
it was hard to find out any consistencies in yearly changes. The research also suggested potential areas of development projects for developing the private sector of partner countries.

Development policy experiences and areas of comparative advantages of Korea were introduced as parts of guidelines for development cooperation strategy. Eight areas were figured out including rice productivity improvement, agricultural technology R&D and extension, forestation, and so forth. Tables of contents of strategic documents from a few international organizations, JICA and KOICA, were compared and contrasted, to suggest some ideas on the formats and contents of strategic researches which will be undertaken from the next year.
Plans to Establish an Information Support System for the Development of Agricultural and Rural Policy (Year 1 of 5)

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Research Background

Recently various criticisms have been raised on the current system and tools of agriculture policies, and agricultural and rural policies should be established in line with changes in internal and external conditions. From the policy planning and process controlled by the central government, it is necessary to strengthen rationalization according to the characteristics of the region, to promote the data-based policy. There is a need to develop policy support that can cope with these problems and to build an information support system for them.

This research on the construction of the information support system for the agricultural and rural areas provides basic statistics about the changes in the structure of agriculture and provides periodic statistical analysis such as comprehensive analysis and in-depth analysis. These are beyond the scope of how to provide statistics and to publish various kinds of information. The purpose of this study was to promote the utilization of objective information in the process of establishment, promotion and evaluation of agricultural policies.

Methods

In order to analyze the statistics of the agricultural sector, we reviewed the literature
and conducted surveys for local government officials. In the literature review, the approved statistics and unapproved statistics in the agricultural sector, the utilization status of statistics, the survey items of statistics, the publication cycle, and the problems in utilization were derived. The survey was conducted for statistical utilization and demand analysis. The result shows the demand for systemization was identified.

We conducted a case study of Japan and Canada that operated information support systems using agricultural statistics, and used it as information for establishing the direction of an information system and setting system components.

In order to analyze the use case of agricultural statistics information, the economic structure of the farm household and indices of the analysis of the local agricultural structure were suggested. As for the farm household economy, the income, consumption and financial structure by farm type were analyzed. On the regional agriculture, comparative analysis of production indices, management indices, production base, environmental indices, and budget structure was conducted.

**Research Results and Implications**

First, policy decision should secure practical rationality and procedural rationality. Second, policy-making rationality should be guaranteed by establishing data-based scientific policies. Third, it is now necessary to approach the central agricultural policy system considering decentralization in terms of improving the decision-making capacity of local governments.

In order to improve the reliability of local statistics, it is necessary to increase the approved statistics related to agriculture along with reorganization of the classification method to enhance the use of agricultural statistics.

Five basic directions of information systematization for agricultural policy decision making are presented. First, to ensure the logical consistency of policy, the information system needs organic linkage from the viewpoint of planning (plan) - execution (do) - evaluation (see). Second, regional analysis and benchmarking should be possible. Third, statistical techniques and analytical tools should be used to ensure mutual connectivity.
between data. Fourth, it is necessary to standardize data which is the core of the information system. Finally, it should be a system considering users' convenience.

This study presents a yearly research roadmap for the five-year study. The roadmap proposed in this study needs to be revised and supplemented in consideration of the following points. First, local government officials' demand for the information support system needs to be considered, and the general public should also be able to use this system. Second, the system developers should have the capacity to integrate, analyze and operate related information. Third, it is needed to build the system by closely identifying demand through the establishment and evaluation of the agricultural policies using the statistical information in cooperation with local governments.
Current Situation of Rural Social Cohesion and Policy Improvement Measures (Year 2 of 2): In-depth Study on the Multi-cultural Families and Urban-to-Rural Migrants

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Background of Research

This study is an in-depth study on the social cohesion of rural multi-cultural families and urban-to-rural migrants. Rural multi-cultural families and urban-to-rural migrants have various socio-cultural backgrounds and they are becoming key factors in the change of Korean rural society in recent years. Therefore, rural multi-cultural families and urban-to-rural migrants are very important groups in the discussion of rural social cohesion. This study aimed to investigate the current situation of social cohesion of rural multi-cultural families and urban-to-rural migrants and suggest policy improvement measures.

Method of Research

This study employed several surveys among rural multi-cultural families and urban-to-rural migrants, focus group interviews, in-depth interviews, a collaborative research, and investigation of existing data. The survey was conducted among 514 rural multi-cultural families and 543 urban-to-rural migrants. Four focus group interviews on the current situation of social cohesion of rural multi-cultural families and urban-to-rural migrants were conducted. The in-depth interviews were conducted among 22 rural multi-cultural families and 16 urban-to-rural migrants. The collaborative in-depth
research with the Korean Women’s Development Institute on the social cohesion of rural multi-cultural families was conducted. Existing related data were collected by searching the data of related research institutes and government organizations.

Descriptive statistics such as frequencies, percentage, means and t-test, F-test and chi-square test were conducted to elucidate the current situation of social cohesion of rural multi-cultural families and urban-to-rural migrants. Finally, multiple regression was employed to identify the influential factors for the level of perceived social cohesion.

**Research Results and Implications**

Social cohesion of rural multi-cultural families and urban-to-rural migrants has been investigated through four aspects: economic aspect, socio-cultural aspect, political aspect, and comprehensive aspect.

Major policy tasks to improve the social cohesion of rural multi-cultural families are as follows: 1) in the economic aspect, ① strengthening job placement and vocational education, ② actively using social economic policies, and ③ prohibiting discrimination against female marriage immigrants in economic activities; 2) in the socio-cultural aspect, ① expanding social exchange between multi-cultural families and ordinary rural residents, ② improving Korean language education, ③ strengthening family education and bilingual education, and ④ strengthening learning support and career guidance for children of multi-cultural families; 3) in the political aspect, ① expanding political participation of multi-cultural families, and ② strengthening prevention and management of discrimination.

Major policy tasks to improve the social cohesion of urban-to-rural migrants are as follows: 1) in the economic aspect, ① activating the social economy with urban-to-rural migrants and indigenous people in the community, ② improving housing purchase and lease support, and ③ providing and arranging job-related information; 2) in the socio-cultural aspect, ① promoting the social exchange between urban-to-rural migrants and indigenous people in the community, ② cultivating community spirit and strengthening mutual understanding education, and ③ activating a mentor system; 3) in the political
aspect, ① establishing the democratic and transparent village operation base, ② establishing a conflict mediation system and strengthening prevention and management of social conflict, and ③ promoting support for urban-to-rural migrants.
Background of Research

A variety of socio-economic trends influence rural areas. The low birth rate, aging society, low growth and 4th industrial revolution have made sustainability of rural areas uncertain and have significantly caused rural differentiation. Some rural areas have experienced population growth and reckless development, while others have suffered from aging, population decrease and rural marginalization. Hence, it is important to identify what factors potentially affect rural areas in the future and derive long-term strategies for sustainable rural development. However as there are limited researches that forecast and analyse rural futures, it is difficult to draw rural planning strategies with credible scientific verification.

This research is designed to provide objective and concrete evidences of future changes in rural areas in terms of population, society and economy, and to propose directions of planning strategies on rural development.

Method of Research

The result of the second year study is obtained efficiently through literature reviews and quantitative analysis. Scenario planning is conducted to select the most significant socio-economic trends that would decisively change directions of rural futures. The
essential part of the research is developing the rural future prospect model using the system dynamics method. The model consists of sub-models of population, households and housing, economy and land use and is operated by applying a business as usual scenario and additional two scenarios deducted from the scenario planning. Estimates produced by the model are analyzed to grasp changes of rural futures from the perspective that rural areas are places for life, work, rest and local community.

**Research Results and Implications**

The total rural population will slightly increase due to urban to rural migration for a short term, but then it is expected to decrease continuously. Mountainous rural areas will particularly undergo rapid population decline. However, rural areas located around the capital and metropolitan cities will mostly experience population growth. Also, it is very likely that ageing will be intensified in most rural areas and that functions of rural centers will be gradually reinforced. Therefore, it is necessary to develop effective service delivery systems that compensate for unfortunate service shortage in marginalized rural areas.

Regarding the rural economy, agricultural job opportunities will gradually decrease and land use of agricultural production is expected to be shrunk. On the other hand, since the number of jobs in the manufacturing industry will increase in many rural areas, suitable planning strategies that balance conservation and development in tandem with securing optimal capacity of industrial sites need to be established.

Conservation of forests and fields is another important issue to pursue rural areas as resting places. The amount of forests and fields is forecasted to decrease when economic conditions are positive. It is necessary to devise measures that prevent indiscreet development behaviors. Also if artificially developed land reverts to forests and fields due to economic depression and population decline in rural areas, it is important to identify the most sustainable way to preserve forests and fields and promote the local economy through constructing environment-friendly recreation and resting facilities that are in harmony with the preserved natural resources.
As existing rural residents are aging and autonomous generation renewal within rural local community is unrealistic, the percentage of newcomers in rural areas will increase. Therefore, composition of rural local community will become dynamic in the future and it will change traditional and typical characteristics of rural local community. Hence, it is likely that the new type of local community will be formed and that policy instruments that foster healthy local community will be needed.

As we discussed above, rural areas will be more differentiated by a variety of factors and they will confront unexpected and unequal opportunities and threats. However, existing government programmes and projects and development-oriented planning strategies will not be able to solve the problems and make full use of the opportunities. Therefore it is necessary to introduce a rural spatial planning scheme that includes inclusive, smart and sustainable rural development strategies and the detailed and tailored development measures that thoroughly reflect socio-economic and spatial characteristics of differentiated rural areas. The rural spatial planning scheme has to be an integrative scheme that is aggregated with policy instruments relevant to agriculture and rural areas. It means that the rural spatial planning scheme becomes a key foundation of coordinating a variety of overlapped government programmes and projects considering spatial characteristics of rural areas. Also, the rural spatial planning has to be a long-term scheme, and the central and local governments’ plans should be consistent.
The Impact of the New Climate Regime on the Agriculture, Livestock and Food Sectors and Countermeasures (Year 2 of 2)

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Background of Research

The international society launched a new climate regime in November 2016 to cope with the accelerating climate changes. The new climate regime focuses mainly on the mitigation of greenhouse gases known as the cause of climate change and on the adaptation to minimize adverse effects of climate change. Korea has participated in the new climate regime and established voluntary objectives to cope with climate change. To achieve these objectives, it is necessary to select and faithfully implement cost-effective and feasible means. This research was carried out to analyze spin-off effects of these voluntary objectives on the socio-economy including the agricultural and livestock food sector, and to come up with a systematic and feasible response strategy. In order to achieve the purpose of the research, an inventory of measures for mitigating and adapting to climate change was constructed and their economic effects were analyzed based on empirical data about each measure, in the first year (2017). In the second year (2018), the economic spin-off effects of application of those measures, the farmers’ capacity for those measures, and their adaptability to climate change were analyzed and a strategy for the new climate regime was proposed.
Research Methods

Marginal abatement cost was applied for economic analysis of measures to mitigate climate change. A structural model was applied for the vulnerability analysis of agricultural production technology to climate change. A bottom-up model of the agricultural sector was adopted to analyze economic ripple effect of application of mitigating and adjusting measures in response to climate change. And a survey of rice, greenhouse, livestock farmers was conducted. Then the factors of accepting intention of technologies in response to climate change were analyzed through the logit model. Lastly data envelopment analysis was applied to measure adaptation capacity of farmers.

Research Results and Implications

Analysis of the marginal reduction cost on the basis of empirical data on the climate change mitigation measures showed that the marginal reduction cost in the energy sector was low in the order of circulation-type water-curtain cultivation system, no tillage, wood pellet heating system, geothermal heat pump, multi-layer insulation curtain, and exhaust heat recovery system to recover exhaust heat from a hot-air heater. It is necessary to carry out measures with low marginal reduction cost preferentially when implementing the reduction policy. On the other hand, even if the marginal reduction cost is low, the farmers’ capacity for accepting the technologies could be low if the initial investment cost is high, so policy efforts are also required to enhance the farmers’ capacity.

Analysis of the vulnerability of agricultural production technology to climate change showed the following results: For rice, climate change would result in the decrease in potential yield and for vegetables, the amount of optimal intermediate material input and the farming costs would increase. In the case of other grains, the potential production would decrease and the amount of optimal material input and the production management costs would decrease as well. These results suggest that the characteristics of each item should be taken into consideration in establishing research and development policies. It was estimated that the breeding size of broilers, laying hens, and pigs, which
were mostly raised in windowless barns, increased while that of Korean native cattle, beef cattle, and dairy cows decreased due to climate change. Therefore, even for the livestock industry, it is necessary to differentiate the strategies for each type of livestock.

A bottom-up model was used to simulate the economic spin-off effects of climate change response measures under the new climate regime. It was analyzed that when the policy goal for each reduction measure was met, the economic effect decreased by 0.035∼0.046%. This suggests that the greenhouse gas reduction policy may be in conflict with economic growth.

A survey of the farmers’ willingness to adopt climate change mitigation and adaptation technology showed that the rice farmers’ biggest concern was the decline in productivity when the technology was introduced while the willingness of those engaged in controlled farming and livestock farming was affected by the cost factor such as initial installation cost, livestock manure treatment cost, and increased management cost. The cost side factor was analyzed to affect the intention to accept. This implies that, in order to improve the farmers’ capacity for adopting the technology to cope with climate change, it is necessary to provide trainings with respect to the method of introducing the technology and the awareness about the technology, and financial supports for facility installation and operation.

As a result of evaluating the adaptive capacity to climate change by region and item, it was shown that the adaptive capacity index of rice was low in Gyeongbuk, Jeonnam and Chungnam regions because the rice farmers in these regions were short of financial capital. In case of vegetables, it was shown that physical capital was lacking in all regions except Gyeonggi and Jeju regions, which was the same for fruit trees in all regions except Gyeongnam, Jeju and Gyeonggi regions. In Gangwon, Jeonbuk, and Chungcheong regions where food crops were mainly grown, natural or physical capital was short. This suggests that regional and product-specific approaches are required, and physical capital (e.g., support for the spread of ICT fusion technology) and financial capital (e.g., support for the expansion of agricultural accident insurance) need to be enhanced, in order to improve the adaptive capacity.

The strategy for the agricultural and livestock food sector under the new climate
regime has set “the agricultural and livestock food sector that proactively responds to the new climate regime” as its vision for sustainable development from the national perspective. The reduction target for the sector was set as “2.65 million tons”, and the objective of adaptation area was set as “to strengthen the adaptive capacity for stable food supply”. As for implementation strategies, transition from high-energy consumption agriculture to low-carbon farming, turning crises into opportunities, and market-centered reduction were proposed for the mitigation field, and adaptation to minimize adverse impacts, strategies to turn crises into opportunities, and long-term investment were suggested for the adaptation field.

As for the key tasks for implementing the strategies in response to the new climate regime, setting new reduction targets and spread of mitigation technologies, preparation of economic/institutional means, education and publicity, and research and development are required in the mitigation field while research and development, economic/institutional means, development and stable supply of agricultural water, and education and publicity are required in the adaptation field.
A Study on the Response Strategies of Agriculture and Rural Areas in the Fourth Industrial Revolution (Year 1 of 2)

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Research Background

The Fourth Industrial Revolution emerged at the same time as the beginning of the 21st century, based on the digital revolution. The key theme of the 46th World Economic Forum Annual Meeting (January 1, 2016) was “Understanding the Fourth Industrial Revolution” and the Fourth Industrial Revolution was suggested as a measure to overcome the global crisis.

Korea also announced the “the People-centered 4th Industrial Revolution Response Plan for Innovative Growth” (November 30, 2017) in order to achieve both “industrial innovation” and “social problem solving”. In cooperation with the ministries of the government, the 4th Industrial Revolution Committee suggests solutions for industrial innovation and social problems.

The agriculture sector is trying to solve the problems such as labor shortage, instability of supply and demand, livestock diseases and food safety. In order to overcome these problems, it is necessary to develop and apply 4th industrial revolution technology in forms of H/W (autonomous farming machine, robot, drone) and S/W (environmental control, pest inspections, agricultural product trading platform, image information).
Research Method

The research method includes collecting and analyzing literature, policy data, preliminary research, and forecast reports for the future to find out future issues of Korean agriculture.

We surveyed 52 experts about the importance of future issues related to the fourth industrial revolution (IoT, AI, robotics, big data, food, R & D, policy) and the feasibility of applying technology. And IPA analysis was also conducted.

The consumer survey was conducted to analyze the purchasing patterns of consumers, the perception of smart shops, the usage of websites, and the willing-to-use future S/W (web, application, etc.).

Through the business trips to Japan, China, and the Netherlands, we grasped the actual state of operation, technology level, technology development direction and policy of smart farms in each country and draw implications.

In the collaborative research with STEPI, we focused on the field of (unmanned and autonomous) agricultural machinery for the innovation growth of agriculture in the 4th industrial revolution era, diagnosed the possibility of agricultural innovation growth and proposed policy alternatives centering on key response issues.

The Challenges of Korean Agriculture

First, we identify the challenges of Korean agriculture. Based on the identified issues, we find the issues of agriculture in future. And to solve the issues, we try to suggest problems and a direction for improvement of the 4th Industrial Revolution application method (H/W, S/W).

The challenges of agriculture are including aging, lack of agricultural labor force, steady decline in farmland area, decline in grain self-sufficiency, worsening of the income gap between rural and urban areas, worsening of cultivation due to climate change, environmental pollution caused by pesticides and herbicides, and food safety issues.
The Future Issues of Agriculture in the 4th Industrial Revolution Era

The issues to solve the problems of agriculture in future are classified into four major categories: increasing productivity and production of agriculture; responding to climate change and converting to sustainable agriculture; creating new value in agriculture; and expanding agriculture.

The first issue is increasing agricultural productivity and production. In detail, it is necessary to increase the efficiency of management by converting to labor-saving agriculture, to increase importance of food security (availability, accessibility, safety), to stabilize prices by upgrading agricultural products supply forecasting, to improve productivity through automatic control of the complex environment.

Second, responding to climate change, we need to change to sustainable agriculture. In detail, with the optimization of resource use (fertilizer, pesticide, agricultural water, agricultural land, etc.), we can reduce costs, fight against the resource depletion, and prevent disasters. Moreover, to produce agricultural products under climate change, we need to introduce new varieties suitable for new climate.

Third, we have to create new value in agriculture. It includes the introduction of a new distribution-related platform that combines online and offline which will lead to efficiency improvement and new market creation, the conversion to an agricultural video auction system, the method of providing necessary information through the network by consumers’ needs, the health-food-related business growth, the personalized consumption of agri-food products, and food safety (history, origin, etc.).

Fourth, we should expand the scope of agriculture. With the application of microbial treatment technology in connection with biotechnology, and the expansion of genetic engineering technology application (GMO, LMO, etc.) to agriculture and livestock products, agriculture is expanding its boundary to new medicine and energy production through biotechnology application, and production of cultured meat using synthetic biology. The scope should not be limited to only the primary products.
Performance of Application (H/W), Difficulties in Diffusion and Improvement Direction

In order to achieve the four issues of agriculture mentioned above, we present the actual condition, performance, technology level and technology development direction, policy direction of the application means (H/W and S/W) based on the 4th Industrial Revolution technology.

It is necessary to develop and distribute unmanned and autonomous agricultural machinery, drones, and robots (H/W) as means to apply the 4th Industrial Revolution technology to agriculture.

The technology level of the unmanned and autonomous agricultural machinery remains at the level of automatic steering (Level 1), and it is estimated that the technology gap with the top technology level country lasts for at least 5 years. If autonomous tractors are used for the production of rice, the production cost can be reduced by 30% compared to the conventional farming method. If we turn the weeding operation into unmanned operation, it takes 1 hour per 10a and 16 hours for manpower, which can save labor time dramatically. In order to increase the efficiency of autonomous farming machinery, it is necessary to improve the farmland base, especially dry-field farming, and to standardize the distance of planting and rearing distances and to standardize the parts of unmanned and autonomous machines.

Drones are mainly used for sowing and pest control (liquid, fertilizer, homogenizer, smoke). Target crops are various such as rice, field crops, greenhouse horticulture and fruit trees. The core technology of the drone is a control system. Because most of control systems used are Chinese products, it is necessary to develop a control system (S/W). The biggest achievement of agricultural drones is the reduction of pesticide usage and agricultural work time. It is possible to spray 20 liters of aerial pesticide on 20,000 m², and one person can spray pesticide on about 100,000 m² per day. Agricultural infrastructure maintenance is required for drones to have maximum efficiency. No other seeds should be sown or sprayed on the fields other than the user’s paddy or field, and the development of the drone industry itself is important, but the base of the field should be maintained at the same time.
Performance of Application (S/W), Difficulties in Diffusion and Improvement Direction

It is necessary to develop and distribute S/W such as various environment control, agricultural products trading platforms, web, application, image information systems in the production-distribution-consumption sectors as the means to apply the 4th industrial revolution technology to agriculture.

The complex environment control S/W continuously provides good environmental condition for growing the crops, so it can be adjusted to improve the productivity, improve the quality, maintain the environment free from pests and diseases. Farming data is collected to increase the utilization of production S/W, but very limited data has been collected yet, and collected data is not analyzed and processed in earnest. In order to develop and spread the S/W technology in the production field, it is necessary to standardize the agricultural production facilities such as construction, internal facilities, and control system from greenhouse design as well as data standardization.

The distribution of S/W in the distribution sector is expected to have a significant impact on the consumption pattern of agri-food products. On the other hand, the percentage of processed food purchased online was 28.3% five years ago, but it has recently increased by 3.6% p to 31.9%. A new agri-food trading platform is expected to emerge in the distribution sector. Most of the online purchases are made using mobile phones and computers. Among them, mobile phones are highly used, and it is necessary to develop and supply S/W that is used for purchase applications and websites, which are the means of applying the fourth industrial revolution technology.

In the consumption sector, it provides mainly price and standard information when purchasing agricultural products online. In addition, it emphasizes the necessity of image information. In the case of agricultural products, especially fresh agricultural products, color and shape are different from general industrial products, and it is difficult to purchase online. It will take time to link health and food and to produce personalized agricultural products. For example, consumers do not have a clear preference for offering a customized recommendation information to a consumer using
a past history of purchasing information. This is because they have a negative stance on the provision of personal information due to the possibility of its leakage. Consumer’s personal information protection and encryption technology should be developed and distributed using the 4th Industrial Revolution Technology.

**Implications of the Fourth Industrial Revolution Policy of Major Countries**

Other countries want to combine the fourth industrial revolution technology with agriculture to solve problems of agriculture and rural areas.

Under the Horizon 2020, the EU supports international cooperation research projects. Projects related to the fourth industrial revolution in the agricultural sector are pursuing sustainable agriculture using core technology of the fourth industrial revolution such as ICT, robot, and big data.

Japan is trying to solve the dangers such as the decrease of agriculture labor force and aging, profitability degradation, new danger such as climate warming, and respond to diversified demand change. The countermeasure is to minimize labor input by robotization and automation, to pursue strategic productivity using big data, and to increase efficiency by linking production, distribution, and sales.

China faces imbalance structure of production, low quality, and resource constraints. Using the intelligence information technology related to the 4th Industrial Revolution, China tries to solve the problems by optimizing the five elements of labor force, land and natural resources, capital, system, and innovation. Agricultural policies include the smart farming equipment project, the project of connecting the IoT to agriculture and testing in local, the agricultural e-commerce demonstration project, the global agricultural data survey and analysis system construction project, the agricultural information intensification project, and so on.

The implications from the overseas cases are not the aim of the technology development itself of the 4th industrial revolution, but the 4th industrial revolution as a means to identify the problems of agriculture and rural areas faced by each country and
to promote the resolution of them. It is necessary to seek ways to integrate technology development with agriculture and rural areas.

**Innovation Strategy for Agriculture in the 4th Industrial Revolution Era**

The vision of Korea’s agriculture in the Fourth Industrial Revolution era is to create new value-added through sustainable growth of agriculture by strengthening industrial fusion and private innovation capacity.

Strategies are promoting agro-industry ventures and start-ups that have core technological competitiveness. It is necessary to nurture specialized investment companies such as venture capital in the agricultural sector and to activate technology transactions and M&A. It is necessary to create a demand for public projects of new technology and to attract the test bed industry applying new technology. A platform for rapid application of big data and cloud demonstration projects to the agricultural sector is also required. It is necessary to find cooperative models among small and medium farming enterprises related to 3D printing such as equipment-S/W-materials related to the 4th Industrial Revolution, and to promote related industries through creation of public demand.

It is necessary to build a platform for sharing data with high usability and reliability in the agricultural sector. There is a need to strengthen linkages between big data holders at national level. In the United States, a number of start-up companies analyze weather, seeds, and soil data to provide a variety of services for increasing agricultural productivity, reducing costs, and determining harvests. It is necessary to create a business hub such as smart innovation valley, to establish a research facility equipped with sufficient analytical ability to meet user demand, and to expand utilization of the IoT for controlled horticulture and big data study to surrounding farms. In order to realize smart agriculture through ICT convergence, it is essential to construct useful and standardized data.

The laws, systems and regulations that respond to the agricultural environment and technological changes should be improved. In the case of the agricultural machinery
industry, permission for unmanned agricultural machinery is a key issue. In order to activate farmers’ data collection, sharing and utilization, and to create new markets, the privacy laws and regulations should be revised. It is necessary to set up guidelines on the disclosure of the big data of the farmers produced by the diffusion of the IoT and the scope and methods of sharing, and to establish the specialized agencies and norms that guarantee the data reliability and stability.

We must focus on investments in R & D in smart agriculture that can secure global competitiveness. It is necessary to clarify the main research fields and roles of relevant ministries and to establish a collaborative system for systematic research in smart agriculture and R & D. In the agricultural sector, it is required to build a test bed for ICT convergence equipment and facilities, big data, cloud, AI and robots.

It is necessary to cultivate manpower for technology utilization and distribution including professional R & D personnel. Regarding the manpower, it is necessary to cultivate technological manpower and technology distribution manpower as well as smart agriculture R & D manpower. In the field of agriculture, big data analysts are needed along with experts who develop optimal customized S/W by linking growth and environmental data. Meanwhile, the government plans to cultivate 600 professionals by 2022 through Smart Farm Innovation Valley. It is necessary to enhance the utilization ability of various technologies by providing opportunities to participate in demonstration tests of participating companies in parallel with big data analysis and HW/SW education as well as item cultivation education. In this way, it is necessary to provide professional workers with a way to start up a company and find a job with technology as well as to establish a business.
Improving Measures of the Agricultural Policy Implementation System for Regional Decentralization
(Year 1 of 3)

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Background of Research

The Korean government is pushing ahead with “decentralization” as one of its policy tasks to improve the performance of the balanced regional development policy in response to a local extinction crisis and to promote the new development of the national economy facing a low-growth crisis.

The objective of decentralization, improving regional autonomy and responsibility, is also an important challenge for the development of the agricultural and rural sectors, as the sectors have distinct characteristics and differences by region. Accordingly, regional agricultural policy was also promoted, but had limits due to low authority to make important decisions. Decentralization at the pan-government level will create more effective conditions for achieving this agricultural policy goal.

The agricultural policy implementation system should be reformed to promote the development of agriculture and rural communities by responding to the implementation of decentralization and minimizing its negative effects. The reform means resetting the roles of and relation between central and regional agricultural policies, transferring agricultural policy affairs to the provinces, and changing the support system of government subsidies. Also, it is necessary to set up plans to establish cooperative governance between the central and local governments and plans to strengthen regional agricultural policy capacities.
Method of Research

The methods of this study include literature review, field work, a survey, commissioned research, expert forums, and statistical data analysis. For the literature review, we used previous domestic and foreign studies related to the improvement of the agricultural policy implementation system and decentralization, and reviewed the government’s relevant trends and materials including policy tasks and the master plan for decentralization. We visited and investigated agricultural policymakers in each province for the field work, and surveyed agricultural policymakers in each city/province and city/county. The number of the survey respondents was 138. Also, we conducted joint research with the ChungNam Institute to examine field cases more closely, and held five expert forums to discuss decentralization cases at home and abroad and their implications for Korean agricultural policy. Statistical data including budget management data of the Ministry of Agriculture, Food and Rural Affairs (MAFRA) and local finance data such as Local Finance 365 were utilized to examine the current status of finances and distribution of government subsidies and local finances.

Research Results and Implications

The agricultural policy implementation system is a relationship among actors who participate in the entire process of planning an agricultural policy and setting its goal and project direction, securing finances, implementing the policy, and post management. The current centralized system of agricultural policy implementation, a principal-agent model regarding the relationship, has limits in improving the performance of policy due to information asymmetry. To enhance the performance of agricultural policy, it is needed to strengthen each region’s autonomous selection of projects and responsibility by reinforcing the decentralization of agricultural policy. The current agricultural policy implementation system has a limit in improving the performance of policy, because regional agricultural policy focuses on securing government subsidies, rather than implementing internal projects. Also, as many government subsidy projects are implemented with low regional autonomy, performance management has limits in
regions that lack the local workforce for agricultural policy.

Therefore, agricultural policy should also be decentralized, responding to the implementation of decentralization. If the State’s finances are properly transferred to the provinces, it is required to enable the provinces to implement projects with autonomous authority and responsibility more actively, considering local characteristics. Decentralizing agricultural policy will be effective for the development of agriculture and rural communities. In the process, it cannot be ruled out that financial input for agricultural and rural policies may rather decrease with government subsidy cuts and in political relationships in the provinces. It is needed to strengthen regional agricultural policy capacities.

In this aspect, major advanced countries’ cases provide many implications for Korean agricultural policy. Although major countries pursue decentralization, they emphasize the central government’s responsibility in the agricultural sector, with a focus on direct payment programs. The central governments divide their work into local agricultural policy bureaus and directly carry out the work, thereby not laying a burden on regional agricultural policy. Also, the countries show a tendency to implement agricultural policy projects at the integrated central government level, rather than subdividing them, and the implementation unit of regional agricultural policy has generally become bigger.

From these research results, we present the following plans to improve the decentralization of agricultural policy in the first year of research.

First, although it is needed to respond to decentralization, it is required to decentralize agricultural policy more actively as a new strategy for agricultural and rural development. With this goal, it is necessary to prepare countermeasures at the level of MAFRA by establishing the Committee for Decentralization of Agricultural Policy, identifying overall tasks, and setting up improvement plans.

Second, it is needed to divide the role of agricultural policy between the central and local governments and transfer agricultural policy projects to the provinces by stages. Authority and finances should be transferred together with business. It is required to
prepare a plan to transfer agricultural policy projects by stages by classifying them in terms of areas under the State’s responsibility and regional autonomy. In the process, local agricultural policy bureaus can be introduced so that the central government is directly in charge of its agricultural policy.

Third, it is necessary to practically merge government subsidy projects and expand options for the provinces. That is, even for projects that are not transferred to the provinces to realize the principle of decentralization and effectively respond to such problems as the shortage of regional labor for agricultural policy, government subsidy projects should be implemented.

Fourth, cooperative governance should be established between the central and local governments and between local governments. It is possible to consider stipulating the Central-Local Agricultural Policy Council in the Framework Act on Agriculture and Rural Community, introducing the council, and examining agricultural policy quarterly.

Fifth, it is required to introduce a system for strengthening regional agricultural policy and necessary institutional changes. It is needed to improve the effectiveness of regional agricultural development plans which are subordinate to the central government’s agricultural policy plan, and to strengthen regional governance for the reinforcement of autonomous agricultural policy through farmers’ participation. In addition, it is necessary to divide roles between provinces and city/county-level local governments.
The Fulfillment of the Livestock Industry’s Social Responsibility and Policy Issues (Year 1 of 2)

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Background & Purpose of Research

The role that society requires of the livestock industry is becoming more complex and diverse than in the past. But different stakeholders’ positions around the industry vary and social dialogue is not enough. Therefore, the livestock industry must accurately recognize and respond to the needs of society for sustainable development. To this end, it is necessary to figure out what is the social responsibility of the livestock industry and to organize the policies for carrying out the responsibilities.

Method of Research

This study reviewed past researches to summarize how Korea’s livestock policy and related laws have changed in response to changes in internal and external environments of the industry. A survey and IPA were conducted on consumers and producers to analyze the awareness and behavior of the livestock industry’s social responsibility. In addition, the study conducted a consumer analysis using a pro-social utility function to examine whether environmental conservation and animal welfare are significant buying factors.
Research Results and Implications

This study categorized the social responsibility of the livestock industry into four categories: civil responsibility, economic responsibility, ecological and environmental responsibility, and ethical responsibility. And the study summarized the policy tasks required to fulfill social responsibility.

This study defined the role of the livestock industry as "production and supply of safe livestock products by using a way that the people can accept," and thus defined the social responsibility of the industry as "to faithfully fulfill the social needs." In the role of the livestock industry, "an acceptable way" is defined as "the legal production process of livestock products with no negative externality, and further requiring the implementation of ethical acts such as animal welfare."

According to a survey of producers and consumers on social responsibility of the livestock industry, a difference in awareness between the two groups was confirmed. On strengthening social responsibility of the livestock industry, consumers put emphasis on toughening legal punishment when it comes to detecting illegal acts, while producers put the most importance on strengthening government policy support to root out livestock diseases and prevent environmental pollution. In relation to the fulfillment of the social responsibilities of the livestock industry, consumers value the awareness of the reality and voluntary improvement of the livestock industry, while producers believe that greater government policy support is the most important.

The consumer survey has shown that consumers have very low awareness of organic and animal welfare products. However, consumers with experience in purchasing certified products were clearly aware of the importance of the products and were willing to pay additional amounts. Nearly half of the producers in the survey are considering whether to participate in organic livestock or animal welfare certification programs, but are not easily involved due to rising managing costs and concerns about income.
The Current Status of Changes in Korean Rural Villages and Direction for Mid- and Long-term Development (Year 4 of 5)

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Background of Research

With the modernization of South Korean society, the role of rural villages as traditional communities has weakened or ceased. In the process, as the scope of residents’ activities has expanded outwards from their villages, their living zones have changed in socio-spatial aspects. Recently rural villages have shown various aspects due to depopulation and an increase in urban-to-rural migration at the same time. In most villages, the population is decreasing continually. However, there are also cases that social and economic activities are revitalized in villages or a community is reorganized in a way different from the past. In this process, some community activities are reorganized on a larger socio-spatial scale, beyond a village scale. Also, revitalizing rural lower-level centers, which stagnated in the depopulation process in hinterland villages, is an important policy area. For this, it is needed to examine the current status, function, and role of rural living zones comprised of interdependent relationships between rural lower-level centers and villages. This study is the fourth-year project in the five-year research which forecasts the direction of changes in farming and fishing villages and presents policy directions through empirical research considering changes in Korean rural villages. The purpose of this study is to examine changes in rural living zones and factors in the changes, and draw policy implications for rural villages from these changes and factors.
Method of Research

The methods of this study include literature review, surveys for heads and residents of villages, in-depth case studies, and statistical data analysis. Among these, the literature review was used to present the analysis framework of this study by reviewing trends in research on changes in rural living zones and discussions on recent spatial policies. The survey for village heads aimed to identify factors in changes in the function of villages and at the level of a myeon-unit living zone. Also, by utilizing the survey for residents, their characteristics and patterns of their activities were analyzed. To examine long-term time series changes in rural living zones, we conducted an additional in-depth analysis of the case areas of rural villages and myeon-unit living zones examined in the previous study. This study was carried out as cooperative research among industries, universities, and research institutes in which diverse experts in research on rural villages and living zones from research institutions and universities participated.

Research Results and Implications

This study focused on examining rural living zones in terms of rights to use basic living services and rights to economic activities, and on analyzing social, economic, spatial factors in changes in rural living zones. The following are the characteristics of the living zones drawn from the four case areas. First, Seojong-myeon in Yangpyeong-gun, a suburban rural area, is the hub of economic and social activities in the region, and its function of the seat of a myeon (township) office is strengthening. Chochon-myeon in Buyeo-gun, a general rural area, tends to use some living services outside its living zone, due to its location near Nonsan-si. Most basic living services and non-agricultural economic activities of Hyucheon-myeon in Hamyang-gun, a remote rural area, depend on the seat of the county office. On the other hand, Mitan-myeon in Pyeongchang-gun shows that the seat of the myeon office has been formed again as the center of the basic living zone in terms of social, cultural, and economic activities, although the township is classified as a remote rural area. In islands and fishing villages, since bridges were built and islands were connected with inland areas through traffic
routes, the living zones of residents of the islands have expanded, and outside residents' migration has increased.

This study examined factors in changes in rural living zones in the following three aspects: 1) changes in the function of the center; 2) changes in the composition of residents; and 3) changes in regional economic conditions. Implications derived from the analysis results are as follows. First, although rural centers’ function of basic living services has been reduced continually, the range of rural residents’ daily lives is generally within a myeon area. Second, although a rise in the population migrating from cities has recently diversified the demographic composition of rural residents and increased personal mobility, this trend does not necessarily weaken the function of lower-level centers. Third, to enhance the self-sufficiency of rural living zones, although a strategy to strengthen the function of the center for service use is needed, a strategy for promoting economic circulation in a region is also effective.

In conclusion, despite the changes in the trends such as increases in residents’ mobility and in spatial integrity, the outward dispersion of rural living zones will be limited. The functions of living services and the hub of economic activities, which a higher-level center such as a big city provides to the entire region, will be limited to the role of providing certain higher-level services. Only some myeon areas that are difficult to develop into the center of basic living services, including Hyucheon-myeon in Hamyang-gun and Chochon-myeon in Buyeo-gun, will be included in such a sphere of influence. Therefore, it is judged to be continually effective to foster rural living zones focusing on the center of basic living services such as the seat of a myeon office in the future too.
Trade Trends and Prospects of Agricultural Products in North Korea

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Background and Purpose of Research

Recently the situation on the Korean peninsula has suddenly changed in a positive direction. If South and North Korea and the US agree on denuclearization and a peace regime in the current ongoing dialogue, it will be a breakthrough in inter-Korean relations, and economic exchange between the two Koreas which ceased can begin again. This study was carried out as part of the groundwork in preparation for resuming inter-Korean trade in agricultural, forest and livestock products. The purpose of this study is to analyze the current state of and changes in North Korea’s trade in agricultural, forest and livestock products, and seek ways to promote inter-Korean trade in these products based on the analysis when economic exchange between the two Koreas is resumed.

Method of Research

Statistics on North Korea’s international trade have not been announced. In this situation, the statistics can be constructed only by utilizing trade statistics of the country’s all trade partners. This study constructed statistics on North Korea’s international trade in agricultural, forest and livestock products as mirror statistics by using UN Comtrade statistics.
**Research Results and Implications**

North Korea’s trade in agricultural, forest and livestock products has maintained the trade structure of a less developed country for a long time. The country’s major exports consist of collected forest products and agricultural and animal by-products. Among North Korea’s imports, grains including food and soybeans account for the largest share. Also, the country’s trade size is so small that increases or decreases in trade in a few particular commodities affect the total trade size.

If the current ongoing dialogue among South and North Korea and the US progresses, conditions that can promote North Korea’s international trade again may be created with the lifting of sanctions. However, as a change of North Korea’s socialist economic system cannot be expected in the short term, it is difficult to forecast that only easing sanctions will greatly increase the country’s trade in agricultural, forest and livestock products and soon improve the trade structure.

The key to promoting inter-Korean agricultural cooperation and developing North Korea’s agriculture is to boost commercial trade. Therefore, it is necessary to first implement leading development cooperation projects in the agriculture sector; enhance the production capacity of North Korean agriculture by using the projects as incubators; and improve the country’s trade structure of agricultural, forest and livestock products and increase trade.

On the other hand, in the leading agricultural cooperation projects, the selection of crops for inter-Korean trade is important. If importing agricultural and livestock products from North Korea can contract domestic agriculture, it is difficult to promote inter-Korean trade in the products. Thus, at the early stage of agricultural cooperation, it is desirable for North Korea to produce agricultural and livestock products which South Korea has already steadily imported.
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