A Valuation Study on Multifunctionality of Agriculture and Multifunctional Agriculture in South Korea:

Beyond 6th Industrialization

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Abstract

Due to the global warming, environmental pollution and global competition in agricultural sector, the multifunctionality of agriculture (MOA) is attracting worldwide attention, and environment-preserving agriculture and sustainable agricultural development are becoming major policy issues around the world.

Korea concluded FTA with several countries after the financial crisis in 1998. As a result, the domestic industrial economy has been revitalized, but international competition for agricultural products is intensifying, the gap between agriculture and industry is widening, and the increase in the extinction of villages is causing a decrease in the agricultural food self-sufficiency rate. The Korean government has been promoting local food consumption promotion, the 6th industrialization, and a quality certification system since 2000 to solve these problems in agriculture. Since the Park's administration (2013~2017), 6th industrialization has been enacted and promoted until now, but 6th industrialization is biased toward economic and income aspects of agricultural production, processing, and distribution and there is a limit to the efforts to grow the MOA of nature and environment, history and culture, landscape and community recovery in agriculture.

This study is an economic valuation research on multifunctionality of agriculture (MOA) in rural villages and multifunctional agriculture (MFA), for proposing practical ways of comprehensive rural development utilizing MOA in rural villages that can balance economic income with other MOA. The application of economic value evaluation is to suggest the importance of each attribute and a method for agricultural economic activities beyond agricultural production such as MFA and try to clarify the usefulness and direction of implementation of MFA

Specifically, Chapter 1 describes the background and research tasks of this study. In Chapter 2, theoretical considerations were presented on the expected effects in connection with the function and effects of the theory MFA on the nature of public goods or environmental goods. Chapter 3 compares and analyses the EU's multifunctional agriculture and Korea's 6th industrialization policy through policy content and case introduction. It was clear that the 6th industrialization policy in Korea oriented toward economic income-led. Meanwhile, agricultural producers had a weak awareness of MOA, thus the tendency to protect the environment and carry on the tradition was weak. Chapter 4 summarizes the methodological theory of valuation methods for environmental goods such as MOA. As a result of comparing several evaluation methods, such as contingent valuation method (CVM) and choice experiment (CE), the CE method was judged to be an appropriate method for the economic value evaluation of this study.

Following the preliminary study above, Chapters 5 and 6 are the part of the empirical study of economic valuation. In Chapter 5, the CE technique was applied to evaluate the MOA. For analysis, MOA functions of agriculture were classified, and representative functions were extracted. In order to apply the stratified sampling technique, a survey was conducted in which a hypothetical representative MOA was presented and answered for general citizens at Seoul Station and Seoul Bus Terminal, where people from all over the country gather. As an analysis method for the survey result, conditional logit and latent class logit (LCL) models were applied and estimated. As a result, the value was estimated in the order of nature and environment, history and culture, public activity, and landscape. As a result of the analysis of LCL and conditional logit, it was found that there was heterogeneity in the model.

In Chapter 6, it was found that there is a value for MOA, and the value of MFA that can be utilized was estimated. This can show under what conditions meaningful economic activity is possible when promoting MFA. The conditions for promoting MFA were extracted from a total of 11 attributes and 60 types according to van der Ploeg's theory. A survey was conducted same as chapter 5 at Seoul Station and Seoul Bus Terminal by asking which combination is more attractive to the general citizen when visiting rural areas. Conditional logit analysis and probit model were applied as analysis methods for the survey results. As a result, there was no absolute difference in the coefficient values, and the significance and value of each attribute were also the same. The reason for performing these two analyses is to solve the heterogeneity problem that occurs in the conditional logit analysis and to verify the model’s appropriateness. According to the analysis results, implications were interpreted that rural visitors were highly interested in the nature and environmentally friendly areas and the attributes of rural landscapes that can be directly experienced when visiting MFA rural areas. About the facilities, it was

found out that they would prefer wood to other materials and to stay at a hotel in the vicinity than to do something to be able to experience the countryside, and to stay on a farm stay or camping.

Based on the above analysis, Chapter 7 made the following conclusions and policy recommendations. South Korea's sixth industrialization policy has a strong economic orientation of increasing income and has the characteristic of neglecting MOA such as environmental protection. In order to simultaneously increase the income of agricultural farmers and utilize the MOA, it is necessary to promote the EU's MFA or environmentally friendly 6th industrialization to South Korea. There are these kinds of demand among the public. It is strongly desired that the Korean government expand the vector and contents of the measures toward the MOA such as environmental protection, utilizing the best use of the existing sixth industrialization promoting system.

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Abbreviations

ADHD	Attention Deficit Hyperactivity Disorder
BDN	Broadening
CAP	Common Agriculture Policy (EU)
CE	Choice Experiment
CNI	Chungnam Institute
CRM	Contingent Ranking Method
CS	Compensation Surplus
CV	Compensation Variation
CVM	Contingent Valuation Method
DPN	Deepening
EU	European Union
EV	Equivalent Variation
FADN	European Farm Accountancy Data Network
FAO	Food and Agriculture Organization
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
KEI	Korea Environmental Institute
KREI	Korea Rural Economic Institute
LEADER	Liaison Entre Actions de Développement de l'Économie Rurale
MFA	Multifunctional Agriculture
MOA	Multifunctionality of Agriculture
MWTP	Marginal Willingness to Pay
NVA	National Values Assessment
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
RGN	Regrounding
SNU	Seoul National University
UR	Uruguay Round
WTO	World Trade Organization
WTP	Willingness to Pay
WUR	Wageningen University

Chapter 1 Introduction

1. Background

Plato emphasized the importance of agriculture as the abdomen of humans in his book *The Republic*. Humanity has survived so far due to this productive activity, which has existed since the beginning of civilizations. Rural villages and communities made it possible to preserve human life through agricultural activities, which serve various additional functions, such as providing natural resources, historic resources, landscape features and fresh air itself.

South Korean rural villages have experienced many changes in the 50 years since the Korean War (1950–1953). Before the year 2000, they only focused on fragmentary goals: economic development in agriculture and an increase in output. However, the perception of rural villages is changing. Rural space began to be recognized as having new values and resources for the development of the nation after the OECD's ministerial declaration in 1998. Multifunctionality of agriculture (MOA) is defined as agriculture's positive externalities, such as environmental goods, jointness and environmental preservation, as an additional form of production (OECD, 2001). The interest in the MOA amplified after Burrell (2001) asserted that productive agricultural activity and the MOA do not coincide due to the non-trade concerns (NTCs) of agriculture. And it is being emphasized as a logic of agriculture protection for importing countries against exporting countries due to the opening of the agricultural product market by the Uruguay Round (UR) agreement and the foundation of the WTO in 1994. Some studies have been conducted to estimate the separation of the NTCs of agriculture from agriculture (OECD, 2001; Kwon and Yun, 2004; Jung, 2014).

These changes in international affairs and development in rural villages shifted their focus from the agricultural production in the past to the spatial utilization and the multifunctionality of rural villages after 2000. The rural villages' income-leading sixth industrial movement covers production and processing services and has been implemented as a policy to improve farming families' income from Park Geun-Hye's administration until the current regime of Moon Jae-In. Park's administration made the sixth industrial development law in 2015, and the act recognized farm processing as the sixth industrialization and presented detailed programmes

representing the certification institution of farm production. Moon's administration is currently maintaining the policy of the previous government's sixth industrialization.

The sixth industrialization is a self-production value chain model developed from the case of the Agricultural Cooperative of Oita prefecture in Japan, which promoted the growth of underdeveloped mountain villages and has been systematized by Professor Imamura at Tokyo University. The idea of the sixth industrialization is that we should take the agricultural food processing role of the food industry (second) and the agricultural food distribution, information and service offering as well as the tourism offered by most wholesale suppliers and tourism contractors (third) back to the agricultural production area (first) itself. A considerable number of side effects have occurred due to the misunderstanding of the sixth industrialization as merely the concept of $1 \times 2 \times 3 = 6$, such as the birth of agricultural food processor-centred interactive manufacturers or the development of a rural leader-centred cooperative model based on corrupt paperwork by wealthy farmers using peasants' names to obtain subsidies. The industrial and economic aspects of agriculture were the main sources of economic growth in the past but do not match the low economic growth countries of South Korea and Japan.

In 2003 in the EU, with the completion of the LEADER[1] programme in the EU, a discussion utilizing the MOA arose during a scientific and political argument about future agriculture and rural village development. This discussion led to the implementation of the multifunctional agriculture (MFA) policy in the EU. These new policies define agriculture as not just playing the classical role of producing foods and textiles but as involving the management of regenerative resources, the preservation of the landscape and biodiversity and various activities that contribute to the social and economic survival of rural society (Van Huylenbroeck and Durand, 2003; Renting et al., 2009). European and Asian countries, including South Korea, have vastly different agricultural systems geographically, environmentally and historically. While the MOA is appreciated and methods for increasing income by eliminating multifunctionality's market failure are being researched, whether such policies are applicable to each country and local area has not been verified. This point results from the policy pushed

[1] LEADER ('Liaison Entre Actions de Développement de l'Économie Rurale', meaning 'Links between the Rural Economy and Development Actions') is a local development method that allows local actors to develop an area by using its endogenous development potential. The LEADER approach forms one of the four axes of the EU Rural Development Policy 2007–2013 (LEADER Gateway home page).

ahead under the country's internal and external political circumstances.

Europe has admitted the MOA and defined it as an externality of agriculture after the settlement of the UR in 1994, and agricultural direct payments have been propelled as a critical agricultural policy so far. As a result, the environmental change in rural villages has dramatically advanced and improved the MOA. South Korea is just beginning to implement the environmental policies in rural villages, and it is hard to tell whether MFA can progress to a comprehensive agricultural policy. From this point of view, there is a need to seek proper alternatives to Europe's MFA for South Korea's and Japanese the sixth industrialization. Therefore, this study aims to reinterpret the agricultural policy's direction regarding the MOA and rural villages in relation to Europe's MFA.

The perspective on the existence of the MOA has changed since the year 2001. Previously, the existence of MOA was largely denied by some agricultural exporting powerhouses to bypass exporting and customs regulations. However, other nations have suggested the MOA as an alternative to protective trade. The value of the MOA became clear when international organizations such as the WTO, OECD and FAO acknowledged it as an NTC and its values in relation to agricultural backgrounds and environmental concerns. Since then, researchers such as Coleman (1998), Fischler (1998), Anderson (2000) and Kang (2007) have attempted to understand the properties of the MOA as well as its cultural, environmental, historical, social and spatial roles and have performed valuations on the topic.

Most of the research that has estimated the social and existence value of rural villages and environmental resources has evaluated the worth of a particular area of agriculture rather than evaluating agriculture's multifunctionality covering the whole country. In 2004, Yrjola and Kola (2004) estimated the value of agriculture's multifunctionality in food security, animal welfare, rural viability, food safety, environment and landscape using the contingent valuation method (CVM). In South Korea, Kwon and his colleagues' studies estimated the paddy landscape value using the CRM (Kwon and Yun, 2004) and the water resource value using CE (Kwon et al., 2007).

Meanwhile, the research on MFA by van der Ploeg and Roep (2003) and the analyses by Aguglia et al. (2009) and Menghini et al. (2014) classified van der Ploeg's strategy type attributes using data from the European Farm Accountancy Data Network (FADN) and

evaluated their importance to agriculture as a whole through the National Values Assessment (NVA). Finocchio and Esposti (2008) analysed the factors affecting MFA under the common agriculture policy (CAP), targeting farms promoting MFA, similar to this study. However, their study showed the preference and general descriptive statistics using actual FADN data, consisting of the altitude, degree of MFA, region, farmer's age and farm machinery possession, unlike this study, which adopts van der Ploeg's MFA strategy attributes. Summarizing the preceding studies, the research to date has included a number of theoretical theses on MFA, discussions on development plans through MFA valuation applying the preference method using statistical data and the valuation of various types of MOA in rural areas.

While the MOA is defined by its properties and values, MFA is defined as programmes and practices that utilize the MOA, a definition that was first suggested by van der Ploeg and Roep (2003). In the past, the MOA was used as a basis for providing subsidies (Bohoman et al., 1999) and basic income for farmers (Park, 2016) or as baseline data for direct payments in agriculture (Jung, 2014). However, more recently, policies such as MFA have been implemented to utilize the MOA spatially to revitalize agricultural areas. Therefore, the valuation of both the MOA and MFA must take place to protect and utilize their values as well as to establish appropriate future policies for agriculture.

2. Objective of the study

Agriculture not only performs the primary function of food production but also serves to meet various social needs. Such needs include environmental clean-ups, biodiversity and other multifunctional restoration, cultural heritage utilization and food safety (Belletti, 2002). It is the conversion of agriculture's multifunctionality, an externality, into an income-generating business that signifies a close relationship between agricultural production activity and the environment and a systematic value-chain-like form of agriculture even if it is a service industry.

Problems may arise in low-growth countries like South Korea if the concept of agriculture is considered simply as a way of producing food or if an economic income-driven agriculture structure is implemented when the sixth industrialization is adopted as an agriculture development strategy. In addition, since agriculture and rural villages are performing not only

the food production role but also a role in the historical, cultural, social and environmental aspects of the community, the combination of these effects must be considered. Thus, the following objectives and alternative hypotheses can be established.

The first objective is Prepare for the following two main studies. Specifically, (1) explain the two keywords, the basic concepts of MOA and MFA, and the differences between them, (2) organize the market failure related to environmental goods and the economic theory on countermeasures, (3) introducing and reviewing the cases of MFA in the EU and 6th industrialization in Korea and also the difference between MFA and 6th industrialization among their policy and core point of view and (4) reviewing the value evaluation method for environmental goods. The basic concepts of the three theory that market failure due to MOA can be eliminated by agricultural service activities that utilize MOA.

Second, the valuation of MOA is performed by CE Method. This is because, depending on the existence value of MOA, it can be decided whether to carry out the utilization valuation of MFA.

Third, a valuation of MFA strategies is carried out. The value evaluation of multifunctional agricultural activities was to extract the properties of the broadening, deepening, and regrounding strategies suggested by Ploeg (2003) by comparing them with the Korean agricultural programs such as 6th industrialisation, and to evaluate the value of the detailed properties of each strategy by creating a virtual Korean MFA program. Through this evaluation, the development direction of Korea MFA can be suggested, and the importance of each strategy can be measured and reflected in the policy.

Based on the above purpose, the following considerations can be made.

The first is to promote the sixth industrial policy, centred on Korea and Asian countries. The sixth industrial policy is an income-led agricultural policy. As Korea’s manufacturing and processing industry was rapidly revitalized in the 1980s, the country also started a policy to resolve the gap between agriculture and industry, which is directly linked to food security, and it has not escaped the form of an economic industry-centred structure.

Second, if so, it is necessary to understand the unique characteristics of agriculture that differ from those of other industries. It has been recognized that there is a big difference in that agriculture, unlike other industries, generates external effects. It is necessary to understand the

MOA, which performs not only food security but also environmental functions, and to find out whether the MOA actually exists and whether it can be utilized.

Finally, the policy concerns how to control the MOA and transform it into a structured economic cycle. The comprehensive development policy that encompasses space and environment, the vertical structure of the economic industry-oriented policy so far and the form of a policy that integrates economic, social and environmental functions and its main implementation plan will be presented.

3. Research procedure

Followed by the objectives, this study is largely divided into three subparts, as shown in Figure 1.1 First preliminary research in Chapters 1, 2 and 3, the theoretical background of global discussion and significance of MOA and the concept and difference between MOA and MFA compared with Korea and a new theory of market failure and internalization of MOA will be presented.

Second, in Chapter 5, the statistical discussion about the existence value of the MOA in rural villages will be evaluated. The valuation aims to rediscover rural villages' worth through each attribute, recognizing the importance of agriculture, and to propose the need to implement a continuous and sustainable comprehensive rural village programme that will maintain ruralness. Third, in Chapter 6, the means to utilize multifunctional resources based on the results verified in Chapter 5 will be proposed. Next, the applicable hypothetical MFA programme will be statistically evaluated, referring to South Korea's the sixth industrialization, to determine how the benefits from visiting rural villages affect the method for directing the development of comprehensive programmes such as the sixth industrialization and MFA. The evaluation method will estimate the benefits of social and existence value and establish how people (subjects) are maintaining the sense of importance of agricultural production activity, which underlies the comprehensive industry and the service activities of regrounding, deepening and broadening strategy of Europe's MFA, as proposed by van der Ploeg and Roep (2003), in propelling South Korea's agriculture as a whole. In the final chapter 7, the policy points and implications according to the research results are presented, and the lack of this study and the tasks remaining in the future are presented and concluded.

Obj. 1: Preliminary Research

Chapter 1	Introduction Purpose and necessity of research
Chapter 2	Global discussion and significance of MOA Concepts and differences between MOA and MFA Theory of market failure and internalization of MOA
Chapter 3	MFA movement in the EU and the sixth Industrialization in South Korean Differences between MFA and the sixth Industrialization
Chapter 4	Review of environmental goods valuation methodology

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Obj. 2: Valuation Analysis of the MOA

Chapter 5	Representative attributes extraction Valuation MOA by logit and latent class logit model Determining the existence and importance of MOA

Obj. 3: Valuation Analysis of MFA Strategy's

Chapter 6	Establishing a hypothetical Korean MFA program according to the attributes of the European MFA strategy Valuation MFA attributes and strategy by logit and probit model Proposal of direction for Korea MFA promotion based on valuation criteria

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Conclusion and Policy Implications

Chapter 7	**Conclusion** and Policy Implications Lack of this study and future research

Figure 1.1 Research framework and procedure

Chapter 2 Concepts and Differences between MOA and MFA

1. Introduction

In this chapter 2, MOA and MFA theories are explained. MOA presents a general theory by referring mainly to OECD and Kang's and other researchers' studies, and MFA refers to a number of previous studies such as Ploeg and Van Huylenbroeck. In this study, it is necessary to clearly distinguish these two MOA and MFA, so the differences in character and application method and theory are summarized and presented. Based on this, present a new theory of internalizing the value of MOA which has been being considered to be a part of market failure through the MFA program.

2. Multifunctionality of agriculture (MOA)

The concept of MOA first appeared in the international community at the Rio Conference in 1992. In 1995, the term 'multifunctionality' was first used officially during the 50th-anniversary commemoration ministerial meeting of the United Nations Food and Agriculture Organization (FAO) held in Quebec, Canada (Kang, 2007). After that, it started to attract the attention of the international community as importing countries emphasized it in the NTCs of agriculture, a logic of protecting national agriculture from exporting countries' claim to an open agriculture market in the Uruguay Round (UR) negotiation. In 2001, the OECD specified multifunctionality as the numerous benefits in agriculture which may have multiple outputs and accordingly may contribute to the achievement of several societal objectives at once. Applied to the MOA, this approach defines agriculture's positive externalities, such as environmental goods, jointness and environmental preservation, as an additional form of production.

Table 2.1 presents the WTO's definition of agriculture's multifunctionality, founded after the OECD, FAO and UR, and distinguishes the specific content of multifunctionality as a social function, environmental function, economic function, food security function and cultural function. The OECD stated that multifunctionality is agriculture's economic externalities or NTCs and described it as an additional function to agricultural production. In contrast, the FAO reported that multifunctionality is a more specific agricultural production function, the means

of applicable agricultural income generation. Table 2.1 indicates that there are many multifunctionalities companied with agriculture production and these multifunctional functions of agriculture and rural places are inseparable and have a mutual relationship with MOA

Table 2.1 Detailed information on the MOA from the OECD and FAO

Division	Group function	
OECD	① Landscape ② Species and ecosystem diversity ③ Soil quality ④ Water quality ⑤ Air quality ⑥ Water use ⑦ Land conservation ⑧ Greenhouse gases ⑨ Rural viability ⑩ Food security ⑪ Cultural heritage ⑫ Animal welfare	
FAO	Social function	① Mitigation of urbanization ② Viability of rural communities ③ Sheltering function
	Cultural function	④ Transmission of cultural heritage, identity, values and tradition ⑤ Offering a beautiful rural landscape
	Environmental function	⑥ Preventing floods ⑦ Retention of water ⑧ Soil conservation ⑨ Biodiversity
	Food security function	⑩ Supplying domestic foods ⑪ Meeting national strategic needs
	Economic function	⑫ Balanced development and growth of communities ⑬ Buffer for economic crises

Source: Seo Dong Gyun (2002).

2.1 Market failure and externalities of the MOA

In a free-market economy, the market price is an essential determining factor for the producer, indicating the extent to which the production should continue (Kwon and Yun, 2004). A socially optimal level of production can be achieved when the output of the product is determined according to the market price signal. If distorted market prices are delivered to the producers, eventually, market failure will occur even though the producers made rational decisions based on the market information.

Products with the character of environmental material (environmental goods) can experience market failure through the distorted distribution of the market, and, unlike commodities that can be kept under total ownership, environmental material can be consumed without a payment (non-excludability), and its consumption cannot be stopped (non-rivalness) (Kwon, 2007). The

multifunctionality arising from agricultural production activity has these characteristics too, thereby leading to market failure.

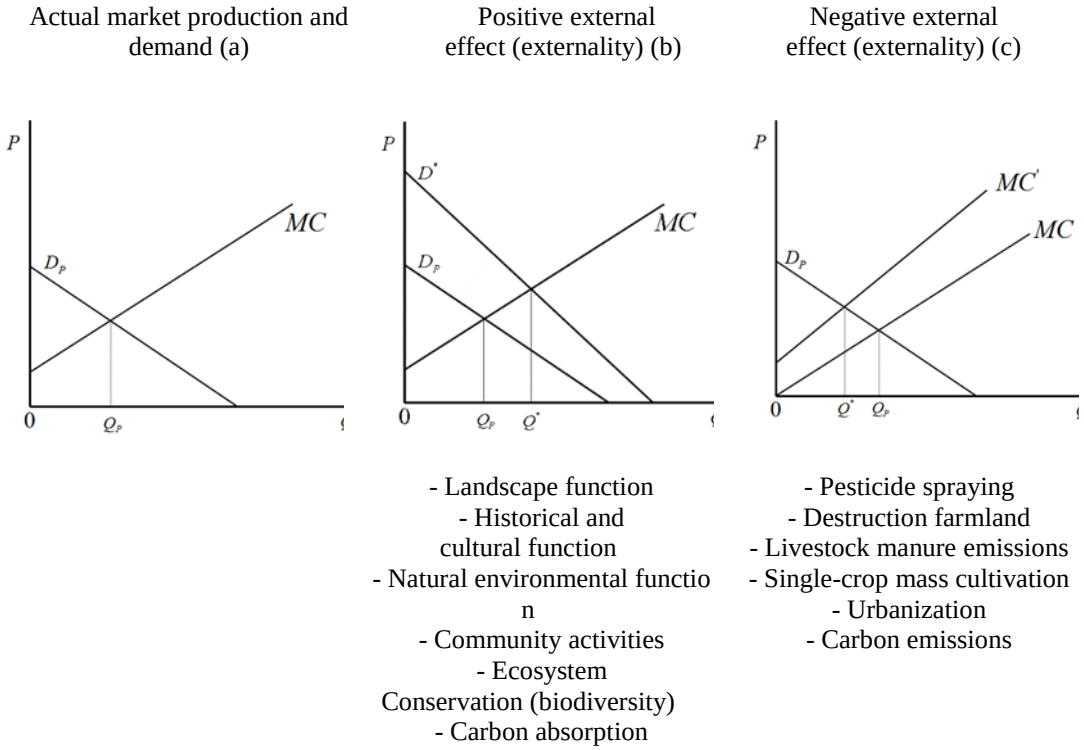

Figure 2.1 Market failure in agriculture due to multifunctionality
Source: Kwon (2007, p. 79, Figure 4-3).

Externalities are generated when the ownership lacks excludability, and, in agriculture, there are positive and negative externalities. If there is no externality, the social optimum is reached at point Q_p, where the agricultural product demand curve D_p and the personal marginal cost curve *MC* intersect, as shown in Figure 2.1 (a). Figure 2.1 (b) indicates the positive externality caused by the MOA. Agriculture generates not just agricultural products but also positive externalities, which can be utilized by anybody due to their non-excludability. As shown in the figure, the agricultural product should be produced in the amount of Q_p if positive externalities were not taken into account, where the agricultural product demand curve D_p and the marginal cost curve *MC* meet, However, if the positive externalities D_H were taken into account by society or consumers, the consumer could reach the social optimum at Q^*, which is larger than $Q_p$mentioned above. This situation leads to market failure.

Figure 2.1 (c) presents the opposite case to positive externalities, explaining the negative externalities. The farm's marginal cost curve *MC* does not accord with the cost curve of the entire society, the social marginal cost curve moves to $MC^{'}$, which is higher than the personal marginal cost curve due to the environmental destruction caused by the farm. In this situation, the farm's desirable output is Q_p, while the desirable output by the entire society is Q^*, much less than Q_p. This can hinder not only the socially optimal cost but also the multifunctionality and farm income as a result of people's avoidance of rural villages due to the environmental destruction.

As shown, market failure occurs due to externalities in agriculture. If the negative externalities are more significant than the positive externalities, this market failure will rationalize the failure in the fairness of experience activities, tourism and social investment based on rurality. However, the continuous occurrence of rural villages' negative externalities would cause a crisis for farms, rural villages and the country. Thus, the policy must maximize the positive externalities and minimize the negative externalities.

2.2 Market failure elimination through multifunctionality

Kwon (2007) theoretically explained the cause of market failure and proposed three methods to solve this problem in legal, institutional and administrative ways.

The most popular and straightforward way to remove the market failure of agriculture's positive externalities is government's direct subsidy based on the environmental improvement cost per unit area of agricultural production. Though the size of this kind of grant is hard to determine, there is ongoing research to establish a standard for the valuation of the MOA.

Figure 2.2 shows a general theory for eliminating market failure through positive externalities. Where, D_p is the consumer demand curve excluding the MOA, and D_H is the demand curve including MOA. If the externalities were taken into account, the demand and supply curve proposed earlier, makes supply Q_p, not the optimal social supply Q^*, which leads to a decrease in producers' output and market failure. When the government pays a subsidy or direct payment with the per unit amount of the social welfare cost *S* to the producer, the marginal cost curve *MC* for the producer will move to $MC^{'}$, and then the producer's optimal output

becomes the socially optimal Q^* and the market failure can be eliminated.

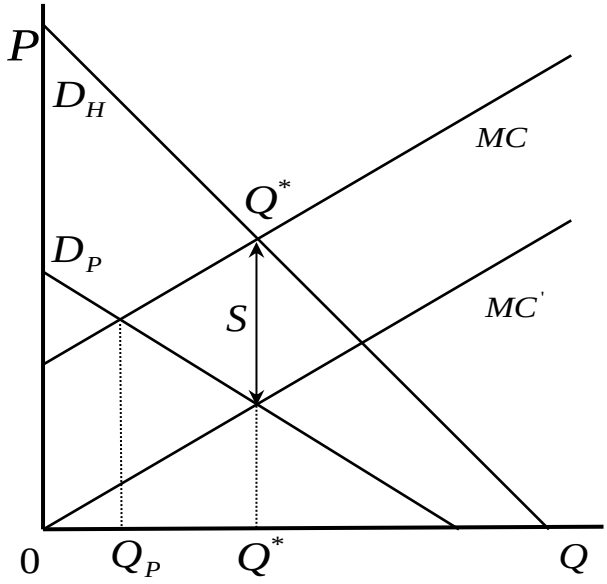

Figure 2.2 General method of Market failure elimination

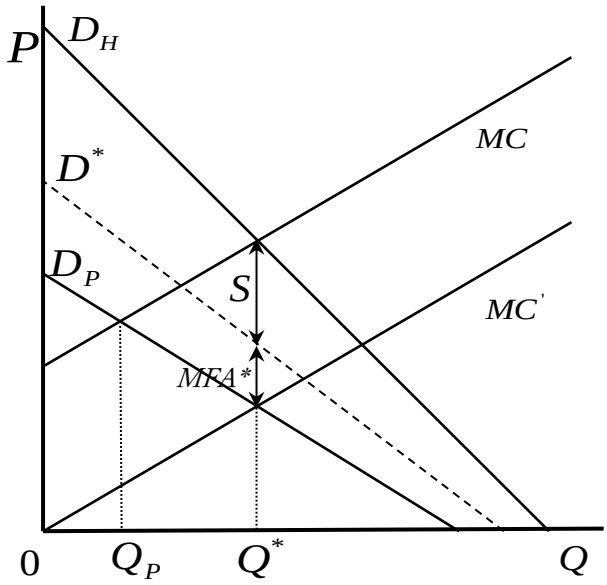

Figure 2.3 A new theory for Market failure elimination utilizing MOA

Meanwhile, in this study, a new way of eliminating market failure is shown in Figure 2.3. In this figure, D^* is the demand curve that farmers themselves can eliminate market failures through business activities such as the MFA program when the overall market failure of

agriculture by MOA is D_H. The market failure occurred because the existing method to eliminate market failure assumed that there was no compensation for the MOA or positive externalities. Then, it is the theory that farmers can directly solve as much (or more/less) as MFA^* corresponding to D^* among the market failure $S + MFA^*$ from net production D_P to net production with externality D_H with an income activity that utilizes MOA. This is a new theory, and it suggests that the consideration for compensation for S or MFA^* can be solved with programmes such as MFA. This is similar to the idea of paying an admission ticket and enjoying the scenery.

MFA's methods of converting multifunctionality into producer's economic income include farm relaxation, autism treatment and care and rehabilitation for social misfits. These economic and social effects should exist as positive externalities derived from agriculture, and it is difficult to expect economic success in the region where the negative externalities occur. For instance, a devastated rural environment will not provide an excellent service for patients or elderly people who want recuperation. Furthermore, even some economic damages will occur when livestock faeces build up or pesticide spraying diminishes the will to consume agricultural produce.

Thus, the farmers are paid the economic income MFA^* from MFA activities in addition to the government subsidy S for social optimum Q^* can be realized, MFA will be one of solving methods and internalization methods to reduce or remove the market failure in agriculture by farmers themselves. This also eliminates the social distortion effect, moral laxity and the violation of free trade regulations.

From this view of point, Rural and agricultural activities must unfold in the direction of maximizing agriculture's positive externalities, and the basic premise must be activities that improve rural village environments, including resource circulation, eco-friendliness and agricultural diversification.

3. Multifunctional agriculture (MFA)

3.1 MFA's definition

In 1998, the EU funded a study (the EU IMPACT study) aiming to investigate the extent of diversification in the EU farms. Since then, numerous studies have been carried out on this topic with the same purpose. In 2003, with the completion of the LEADER programme, the discussion on utilizing the MOA appeared during a scientific and political argument about the future development of agriculture and rural areas. This discussion proceeded to MFA and defined agriculture as not just fulfilling the classical role of producing foods and textiles but also engaging in the management of regenerative resources, the preservation of the landscape and biodiversity and various activities that contribute to the social and economic survival of rural society (Van Huylenbroeck and Durand, 2003; Renting et al., 2009).

The concept of MFA is mainly applied in Europe, particularly in the Netherlands, and is defined as economic activities beyond agricultural production activities (VNG, 2011). It is also defined as utilizing the externalities of agriculture to provide agricultural and one or more other services (Hurni, 2012). It can be described as a shift from the past production-oriented industry to rural income generation with multifunctionality derived from the service industry functions of farming. Beyond the fundamental food production function of agriculture, which is the main difference from MOA, MFA corresponds to the social demand for various types of agriculture that have not been widely noted in the past, such as biodiversity restoration, environmental clean-ups, multifunctional restoration, cultural heritage utilization and food security (Belletti, 2002). This is the transformation of multifunctionality, an external effect of agriculture, into an income-generating business of agriculture, which features a close relationship between agricultural production activities and the environment and even incorporates the service industry as a new agricultural form (Jung et al., 2014).

MFA is based on a changed perspective on agriculture to overcome its limitations as a simple food production system, which challenges it to integrate the environment, culture and rural development (Potter, 2002; Dobbs and Pretty, 2004). It is also designed to promote the interests of farming households through various ecological services involving new entrepreneurial

activities as well as the commercialization of agriculture (Wilson, 2007; Jordan and Warner, 2010). By utilizing positive externalities, such as the MOA, the government can eliminate the market failures related to the externalities of agriculture through endogenous activities which are utilizing externality such as echo-experience of farming households, and by establishing the sustainable farming direct payment systems for environmental preservation.

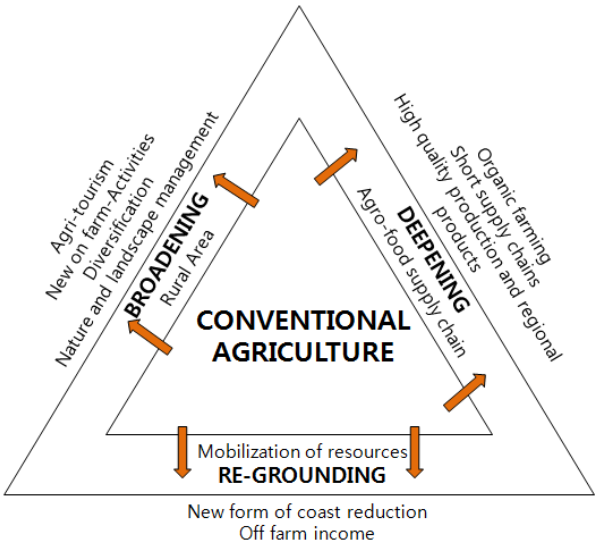

Figure 2.4 Van der Ploeg's MFA as base for rural development
Source: Van der Ploeg and Roep (2003).

The classification of MFA is primarily based on the concepts outlined by van der Ploeg and Roep (2003): a framework that accentuates diversification explicitly towards MFA, with multifunctional diversification, extending beyond the limits of the typical multi-crop or multi-livestock production of conventional agriculture. In addition to the core business of traditional agricultural activities, rural development and performance improvement can be achieved through the three alternative strategies of deepening, broadening and regrounding, as shown in Figure 2.4 These strategies aid the expansion of farm business activities and can simultaneously be grouped as new activities, markets and managerial solutions (Finocchio and Esposti, 2008).

Of the three strategies, deepening mainly refers to the integration of new unconventional activities into the conventional agricultural system, such as the reorganizing of production with more complex and integrated practices, the innovation of products and the enhancement of the

qualitative aspects. These activities typically add value to agriculture, such as direct dealing or processing of agricultural products.

Broadening mainly relates to the development of non-food production activities that reflect new market requirements and could create a new income source. An example is the use of farming facilities as farm holidays (e.g., on-farm activities and care farm activities) (Baldock et al., 1993; Renting et al., 2009).

Regrounding mainly concerns all the non-agricultural activities that are complementary to the main ones. The purpose of regrounding is the mobilization and use of resources. Here one can identify a process that might be summarized as re-grounding (van der Ploeg 1999). That is, the farm enterprise is grounded in a new or different set of resources and/or involved in new patterns of resource use. It is the most widely used strategy as it involves more extensive forms of integration between the farms and the local environment (e.g., the maintenance of gardens, production of animal feed and silviculture) in providing natural services (Menghini et al., 2014).

3.2 MFA's functions

Figure 2.5 shows the organic relationship between the role and the functions of agriculture presented by the IAASTD (2008a). Van der Ploeg and Roep's (2003) basic theory of MFA is represented by regrounding, deepening and broadening, but no specific functions or effects are explained. Jung (2014) described the functions of MFA based on the relationship of the IAASTD's (2008) social, environmental and economic effects.

From the original perspective of MFA, its effects can be distinguished into those on economy, society and environment. MFA means diversification in economic terms, enhanced relations in social terms and sustainability in environmental terms.

First, MFA exerts an economic effect through activities promoting the added value of agricultural products. These include the differentiation of existing food from new kinds of products, such as organic food and slow and traditional food, and activities that promote farmers' income, such as processing/cooking activities and direct sales. It also has an economic effect through the creation of new markets for non-food products (services) and vitalizes markets, such as the agricultural and rural tourism, education/experience and recreation/healing service markets, through the promotion of rural multifunctionality. One point to bear in mind is

that the non-food (service) market is closely linked to the food product market. In other words, more closely linked non-food (service) and food product markets means more direct selling of agricultural products, processed goods and food to visitors, and visitors experiencing these will promote them to others. These activities lead to the economic vitalization of the rural economy, which can be divided into (1) an increase in the local economic added value focusing on agricultural products and (2) the creation of new jobs in the local economy, mainly embracing vulnerable groups of the community, such as women and the elderly (Huylenbroeck et al., 2007).

The social effects of MFA are mostly related to the environment, which can be divided into the effects of maintaining the social culture of rural areas through agriculture and the effects of recreation, relaxation and education through non-agricultural people's experience of farming activities. Maintaining rural communities includes maintaining the rural community spirit, economy and traditional culture. Rural areas provide recreation for the urban population in vacation destinations as well as relaxation and therapies to cure mental disorders and the addictions of certain groups. Education through MFA programmes helps to inform the general public about the value of agriculture and food from a young age. These social effects can create a new quasi-public service market in the form of payments made jointly by individuals and the government. In other words, most payments are made in the form of social security systems such as national health insurance, public education and social security, and the rest are made by individuals in the private market (Jung et al., 2014).

The environmental effects of MFA, like the social effects, substantially act as environmental goods, some of which play a premium role in the commodity and service markets. General agriculture, especially conventional agriculture, is known to have negative externalities. Efforts are needed to minimize the adverse effects caused by negative externalities while maximizing the positive effects. In particular, these environmental effects are fundamental to economic and social improvement. Through such efforts, rural multifunctionality can be maintained in general, which can lead to sustainability, such as maintaining biodiversity and water and soil resources while reducing the climate change and global warming impacts resulting from agricultural activities (IAASTD, 2009; Jung, 2014).

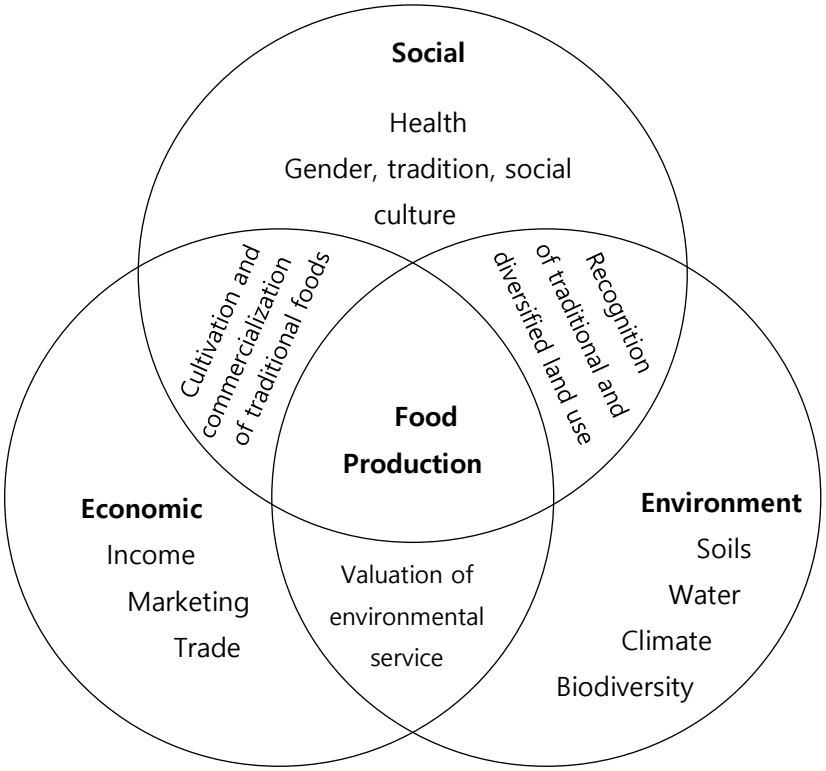

Figure 2.5 The inescapable interconnectedness of agriculture's roles and functions
Source: IAASTD (2008).

By combining the strategic and effective aspects of MFA, we can structure the sustainable development direction of agriculture in rural areas, as shown in Figure 2.5.

The purpose of MFA is to redefine agricultural and rural areas as multi-use spaces, away from the fragility of agricultural production or food production, and enable them to form a value chain with the economic, social and environmental effects of state and rural areas

3.3 Differences between MFA and MOA

MOA and MFA are clearly distinguished. MOA is defined as the numerous benefits in agriculture which may have multiple outputs and accordingly may contribute to the achievement of several societal objectives at once (OECD, 2001). MFA is defined as economic activities beyond agricultural production activities (VNG, 2011).

Table 2.2 Differences between MFA and MOA

MOA/MFA	Concepts and definition	Examples
Multifunctionality of Agriculture (MOA)	Social effects by economic activities in agriculture (OECD, 2001)	Landscape, Clean air, History, Flooding prevention, Culture,
Multifunctional Agriculture (MFA)	Economic activities beyond agricultural production (VNG, 2011)	Care farm, direct selling, natural management, eco-experience

When speaking about MFA, it needs first to define the concept. The socio-economic literature on multifunctionality provides several definitions for this concept and uses different terms to describe the same phenomenon. Since this multitude of definitions hampers the research on the topic, impeding for example the search for appropriate literature, it gives an overview of the existing definitions and finally expresses an own viewpoint (Huylenbroeck et al., 2007).

In the broadest sense, MOA includes four kinds of functions provided by agricultural enterprises. The green functions consist, amongst others, of landscape management and the upkeep of landscape amenities, wildlife management, the creation of wildlife habitat and animal welfare, the maintenance of biodiversity, improvement of nutrient recycling and limitation of carbon sinks. Other public benefits that can be created by agriculture are the blue services and contain water management, improvement of water quality, flood control, water harvesting and creation of (wind-) energy. A third kind is called yellow services and refers to the role of farming for rural cohesion and vitality, ambience and development, exploiting cultural and historical heritages, creating a regional identity and offering hunting, agro-tourism and agro-entertainment. Finally, many authors acknowledge the white functions produced by agriculture, such as food security and safety (Aldington, 1998; Dobbs and Pretty, 2001; Harwood, 2003; Moyer and Josling, 2002; Jongeneel and Slangen, 2004).

Many authors give a different interpretation of MFA. Following Hediger (2004), the concept accounts that agriculture is an economic activity that, beyond its primary function of supplying food and fibre, provides various non-market outputs to society. MFA is a way in social and spatial view to describe a different farming system that is more territorially embedded, making use of local resources and trying to build a new link between consumers and producers (Wilson, 2001; Renting et al., 2003; van der Ploeg and Roep, 2003). In a sense, this view links both the supply and demand side by relating it to the rural space and the whole agro-food system. Wilson

(2004) speaks in this context of multifunctionality as a regime as it reflects a further transition after the shift from productivism to post-productivism in agriculture (Huylenbroeck et al., 2007). As an analytical concept, MFA refers to the fact that one activity can have different outputs. It is thus related to an economic activity (either a single activity like the cultivation of wheat or a group of activities like food production), while diversification means that different economic activities (e.g. food production and tourism) are combined within the same management unit (in case of the farm or the agricultural sector). Pluri-activity refers to the fact that one person or a group (farmers or rural entrepreneurs) are involved in different activities (e.g. farming and non-farming) (Huylenbroeck et al., 2007). These economic activities are new economic activities that transcend the boundaries of agricultural production activities, and thereby serve as a connection between other agricultural-related companies and city dwellers.

To summarize, MOA is an external effect that occurs in agricultural production activities or rural space, and the external effect is characterized by non-realness and non-exclusivity from consumers. Therefore, this effect can be used by anyone without payment. Meanwhile, MFA is a program or some practical activities that convert the MOA into economic income.

4. Conclusion

Agricultural activities produce external effects, such as the MOA. In 2001, the OECD specified the MOA as the numerous benefits in agriculture which may have multiple outputs and accordingly may contribute to the achievement of several societal objectives at once. This definition of the MOA defines agriculture's positive externalities, such as environmental goods and environmental preservation, as an additional form of production. Research on this multifunctionality has taken place since the 2000s. However, despite its non-rivalness and non-excludability, it has been failing in the market. Here, it suggest MFA policies utilizing the MOA as a viable solution to market failures alongside the existing subsidy and direct payment policies.

MFA, a policy that utilizes the MOA, was first suggested by van der Ploeg and Roep in the Netherlands in 2003. MFA was defined as a policy that transforms the MOA into one or more service activities. It was suggested that the agricultural market failures can be saved by implementing MFA policies that transform the external effects of the MOA into economic

effects.

In this chapter, the theory and characteristics of MOA and MFA are clearly distinguished, and the relationship between the two is on the same line. The market failure caused by MOA can be or possibly resolved by the farmers themselves, and it shows that agriculture should not end with simple agricultural production but should be developed as a spatial industry.

Chapter 3 MFA movement in the EU and the sixth Industrialization in South Korea

1. Introduction

In Chapter 2, the definition of MFA and its functional effects, as well as its theoretical background, were discussed. In this chapter 3, firstly, it will introduce the MFA movement in the EU and the sixth industrialization policy in South Korea, as well as some specific examples of MFA in The Netherlands and Italy. A model example of MFA can be found in the Netherlands, which was the first nation to pass and implement policies regarding MFA. It organized the first government-led support organization MFA task force (TF) for supporting networks and R&D at WUR. Italy also developed a social farm system and cooperative associations. The Alsace region is the most active region in the world for social agriculture, and it is evolving in the form of MFA. On the other hand, a similar but somewhat different policy, named the sixth industrialization is being carried out in South Korea. After introduction of South Korea's the sixth industrialization policy and its characteristic, the similarity and difference with the MFA movement in the EU are discussed. Finally, two examples of voluntary Korean style MFA are presented, although Korean MFA has not been promoted yet by the government. From these two examples, similar regrounding, broadening and deepening strategies have been implemented were found, and the implications are described in relation to MFA and the policy movement in Korea.

2. MFA movement in the EU

In Europe, the trend is shifting from growth-first agriculture to MFA, a new agricultural paradigm. In particular, in the case of the Netherlands, although agricultural exports account for 20% of the total exports and trade surplus accounts for 70% of the total export value, the country has agricultural competitiveness. The local food policy was promoted as a form of MFA. This change is due to the recognition that growth-first and competition-oriented agricultural policies, as we have experienced so far, cannot guarantee environmental destruction and food safety for the nation and the people due to the intensive agricultural production system and the awareness

of the MOA. This is because, as the positive externalities are increasing, the discussion about the possibility of its application is intensifying.

2.1 The Netherlands[2]

The Netherlands recognized the problem of loss of landscape value due to an increase in agricultural production in the 1970s. In 1975 this resulted in a national policy scheme for the conservation of nature and landscape on farmland, in designated areas, with acknowledged nature and landscape qualities. Income compensation payments were paid to farmers who are willing to conserve nature and landscape on their farms. (Henk Oostindie, 2015). Since then, income pressure has been put on farm households (Ploeg et al, 2000) and urged farmers to look for alternative development and income strategies aside from or outside of the agro-industrial value chain. They developed and engaged themselves in several kinds of promising (new or revitalized) activities serving particular consumers or societal needs and functions: on-farm processing and direct sales, marketing of high-quality products, management of nature and landscape, farm integrated care activities, organic farming, energy production, and so on. In the 1990s these strategies were conceptualised in terms of rural development activities through broadening, deepening and regrounding processes (Knickel & Renting, 2000; Ploeg & Renting, 2000; Ploeg et al., 2002) and sometimes as green services (Dagevos et al., 2004; Henkens & van Raffe, 2002). The concept of MFA appears only for the first time in a study by Dutch Agricultural Research institutes in 1996 (Vereijken et al., 1999a; Vereijken et al., 1999b). Thus, the concept of multifunctionality in the Netherlands was initially primarily used in relation to land-use that enabled a combination of multiple 'functions' such as nature, landscape, agriculture, tourism, residential use, etc., in a broader public, political and scientific debate about the pros and cons of spatial segregation versus integration of rural functions (Bloemen et al., 2002; Deelstra, 2001; Gordijn, 2003, Kuhlman et al., 2003; Habiforum, 2001; Wetenschappelijke Raad voor het Regeringsbeleid, 2002).

It can be said that the Dutch apply the standard agricultural policies of Europe as MFA effectively. To double the economic value of agriculture from 2008 to 2012, the Multifunctional

[2] Based on the revised 2012 CNI and EU MFA field trip interview documents (interviewer: Hyunhee Jung).

Farm Task Force, operated by private and civic groups under the government, was established and operated in Wageningen (WUR), the Netherlands. The task force promoted the market demand (added value), communication in local spaces (communication), entrepreneurship (education), the development of various approaches (network), field access research and development (R&D) and the expansion of women's social participation.

The MFA programmes implemented in the Netherlands caused a revolutionary shift for Dutch agriculture, which became the most productive and technologically advanced in the world. The Dutch expressed the will to support MFA intensively for the first time and promoted an integrated policy direction. This MFA, which has been implemented in earnest since 2007, is divided into six policy categories: care, childcare, direct sales, eco-tourism, recreation and educational farming.

Table 3.1 shows the current status of multifunctional agricultural farms' economic performance and sales volume from 2007 to 2011. The desire to enjoy the pleasant natural environment of the countryside and children's playing, experiencing and learning in nature seems to be an important factor.

Table 3.1 MFA form and economic performance in the Netherlands

Classification	Number of farms (company)			Revenue (annual, mil. euros)		
	2007	2009	2011	2007	2009	2011
Healing farm	756	870	1,050	45	63	80
Care farm	20	64	209	4	14	20
Farmer's market	2,580	3,000	3,300	89	128	147
Rural tourism	13,700	13,660	14,000	90	79	86
Recreation	2,432	2,240	2,884	92	121	156
Educational farm	500	500	800	1.5	1.7	2.2
Total				322	407	491

Source: Roest et al. (2011).

For social activities, the number of healing farms for patients with dementia increased from 756 to 1,050 farms in the period of 2007 to 2011. The number of care farms for children that raise pigs and cows and grow crops also increased by more than 10 times from 20 to 209. Similarly, the income of healing and care farms increased. The revenue of healing farms grew from 45 to 80 million euros, while that of care farms rose from 4 to 20 million euros in the 4 years. It is also worth noting that, as the population influx increased as a result of the activation of rural tourism utilizing the healing and care farms, the farmers' market was also activated.

The three primary examples of MFA in the Netherlands are presented below.[3]

1) Ac Hooper – Healing farm and social enterprise farm

This healing farm grows vegetables and raises 6,000 chickens on 12 ha of organic farmland, which is 16 times the size of a football field. The customers who visit the farm are mainly alcoholics, people with mental illness, dementia patients and the elderly. A total of 85 people is currently using the facility. Nurses and 20 caretakers have developed and applied a variety of patient-specific healing programmes. The workforce at the farm is dedicated to helping the customers handle all the farm tasks, such as raising chickens and harvesting vegetables. The agricultural products and eggs produced are certified globally and sold around the world or to the 7,000 to 8,000 tourists on average who visit the area every week, including the families and relatives of the healing programme's patients, at the farmer's market next to the farm. The annual revenue of the Ac Hooper Farm is 1.2 million euros, half of which is earned in direct sales.

2) Child healing farm

This healing farm, operated by a non-profit organization, is linked to a Dutch therapeutic institution in the Dutch Ecological Reserve, a quarter of the size of Yeouido.[4] Children and adolescents with attention deficit hyperactivity disorder (ADHD) and other mental illnesses are the main clients of this healing farm. They walk in nature, interact with animals and socialize with their peers, naturally opening their minds to heal mental and emotional wounds. The farm now hosts 200 children and youths.

3) Farm Zonnehoeve – Care farm, experience farm, education farm and direct sales

Farm Zonnehoeve is the oldest bio-dynamic farm located in the Almere reclaimed area in the northeast of the Netherlands. The farm has 14 workers and caregivers. The farmland area covers

[3] 2012 CNI and EU MFA field trip interview documents (interviewer: Hyunhee Jung).
[4] Part of Seoul, Korea, which is about 605.28 km^2.

50 ha and contains 60 Holstein cattle, wheat, straw, shamrock and sugar beets. The farm operates in the form of mixed and organic farming. The grassland vegetation and the cattle form a sustainable food cycle in which the animals feed on the grass and their stool fertilizes it. In addition to agricultural production, it operates a care farm with social functions, and children can be entrusted to the resident medical and professional caring staff. On the farm, stallions are raised, and horse-riding experiences are also available. On one side of the farm, bread is baked directly from organic wheat produced by young people with drug addiction as part of the mental and physical restoration activities. Educational farms are examples of the deepening and broadening of traditional farming customs, such as educating children on natural and safe agri-foods and holding corporate workshops.

2.2 Italy

In Italian agriculture, 99.23% of family farmers are involved in MFA. While currently more than 80% of farmers are dependent on production-oriented agriculture in Korea, it can be seen that Italian agriculture is more diversified. Through the MFA strategy, the deepening was most active at 47.45%, and it included agricultural product processing (37.6%) and direct sales (22.8%), which are generally preferred by farmers. The regrounding accounted for 42.5%, which was suggested as a combined activity, and the broadening was 37.2%, the highest attribute was land lease (33.7%).

In summary, in the rural context, many activities, such as agricultural tourism, diversification, nature and landscape management, were broadening, contributing to the generation of added value in Tuscany. The agri-food network shows a ‘deepening’ change, and practices such as organic farming, quality-based production and shortened supply chains have been carried out, with farms sometimes combining production activities based on these three. In the case of organic products, taking advantage of the characteristics of a niche market, a direct trade model has been introduced. Combined and cost-saving activities have been observed in the efforts to reground internal resources (FARP, 2013).

Table 3.2 Status of Italian MFA (2006)

	Total	The ratio of farms over the total number of farms (%)	The ratio of farms per category (%)	The number of farms	The ratio of family farms over the total number of farms (%)	The ratio of family farms per category (%)
Broadening	263,528	37.23	100.00	261,558	37.24	100
Rural tourism	12,789	1.81	4.51	12,538	1.79	4.46
Landscape preservation	4,266	0.60	1.50	4,228	0.6	1.5
Biodiversity preservation	1,957	0.28	0.69	1,956	0.28	0.7
Utility rent	23,536	3.33	8.30	23,295	3.32	8.28
Land lease	238,701	33.73	84.18	236,973	33.74	84.25
Regular rental	2,305	0.33	0.81	2,286	0.33	0.81
Deepening	335,233	47.36	100.00	333,249	47.45	100
Direct sales	131,235	22.78	27.97	160,363	22.83	28.01
Proof of origin	71,482	10.11	2.40	70,573	10.05	12.33
Organic farming	29,567	4.18	5.13	29,341	4.18	5.13
Hypoallergenic agriculture	39,556	5.59	6.86	39,182	5.58	6.84
Landscape painting	8,816	1.25	1.53	8,816	1.26	1.54
Farm-processed food	265,765	37.55	46.11	264,170	37.61	46.15
Regrounding				298,542	42.51	
Combined activity				298,542	42.51	
Total farm	707,776	100.00		702,360	99.23	

Source: FARP (2013).

A relevant example, Villa Capreracia, a wine farm located in Livorno, offers agricultural tourism activities enabling visitors to experience and sell products mainly produced from wine. The farm improved the quality and direct bottling of the wine that it produces and processes. It promotes added value through direct sales; it has adopted a family labour system that emphasizes women's roles and has redeveloped human resources by developing new knowledge and expertise and fixed assets, for example by reconstructing facilities and introducing bottling facilities. Such reformation of the farm strengthened its regrounding, deepening and broadening activities. As a result, the local economy was revitalized through the increasing tourism demand and employment opportunities for the local community. Additionally, the regionality of the products was strengthened. These activities were accompanied by government support, such as vocational education and investment assistance (Jung et al., 2014).

Table 3.3 MFA of Villa Capreracia

1) Contents		
Broadening	Deepening	Regrounding
Agricultural tourism Linkage between the products and the area	- Improved wine and bottling quality - Farm processing - Direct sales	- Mobilization and use of resources - Reorganized the family labour system (emphasizing women's role) - Reconstruction of facilities - Introduction of bottling facilities
2) Effects and Government support		
Public good	- Area-related quality increase - Increased tourism demand - Increased employment opportunities - Reinforced women's role	
Internalization of non-products	- Premium and high-quality wine - Increased added value through direct sales - Added value generation through agricultural tourism	
Government support	- Job training - Investment support	

Note: The farm area is vineyard (11 ha), olives (2 ha) and other fruits (4 ha).

Cannas Farm, a ranch located in Tuscany, produces cheese directly from sheep's milk and sells it directly to consumers, linking its business with agricultural tourism activities and reorganizing human resources and fixed assets. As a result, the local specialities are diversified and the local economy and the community are revitalized through the increased value added. Public support, job training, public relations and investment assistance were provided by the government (Jung et al., 2014).

Table 3.4 MFA of Cannas Farm

1) Contents		
Broadening	Deepening	Regrounding
- Agricultural tourism - Introduction of a new occupational pattern in the shepherd community	- High-quality cheese production - Direct sales	- Negotiate with family for independent partial management of the flock - Develop new knowledge and professional skills - Regrounding of family labour - Broadening of processing facilities - Reconstruction of farm buildings
2) Effects and Government support		
- Public goods	- Diversification of local resources - Maintenance of local value added - Linkage between the quality and the local image - Improving the reputation of pastoral activities and communities	
- Internalization of non-products	- Premium price for direct-sales products - Income generation from agricultural tourism	
- Government support	- Job training - Promotion - Investment support	

Source: Jung et al. (2014).

Florida Farm, an organic farm located in Tuscany, adopted the ecological farming method by

newly organizing the farm landscape and converting it to organic farming linked with agricultural tourism activities. Its human resources and fixed assets were reorganized for this purpose. As a result, the rural landscape was improved, high-quality local products were produced and new regional knowledge was created. For this, the EU's fallow subsidies and organic/landscape management incentives provided support (Jung et al., 2014).

Table 3.5 MFA of Florida Farm

1) Contents		
Broadening	Deepening	Regrounding
- Agricultural tourism - Introduction of a new occupational pattern in the shepherd community	- Conversion to organic farming	- Adaptation of ecological farming - Farm landscape regrounding - Development of new knowledge and professional skills - Regrounding of family labour - Reconstruction of farm buildings
2) Effects and Government support		
- Public goods	- Improvement of the landscape - Creation of new regional knowledge - Production of high-quality products	
- Internalization of non-products	- Premium price of organic products - Agricultural tourism income	
- Government support	- The EU fallow support - Organic farming and landscape management incentives	

Source: Jung et al. (2014).

Lastly, Tardeli farm, a ranch located in Tuscany, rebuilt abandoned pastures, which used to be owned by the local municipality, to improve the landscape and animal welfare in conjunction with the provision of agricultural tourism activities for consumers. To this end, human resources

Table 3.6 MFA of Tardeli Farm

1) Contents		
Broadening	Deepening	Regrounding
- Agricultural tourism - Local government land lease	- Direct sales to small businesses	- Conversion of some livestock to beef production - Farm strategy changes - Development of new knowledge and professional skills - Regrounding of family labour - Reconstruction of farm buildings
2) Effects and Government support		
- Public goods	- Restoration of abandoned grassland - Landscape improvement through grazing - Promotion of animal welfare - Creation of new regional knowledge	
- Internalization of non-products	- Agricultural tourism income	
- Government support	- LEADER programme of the EU	

Source: Jung et al. (2014).

and fixed assets were reorganized, and, as a result, the agricultural tourism income, landscape

and animal welfare were improved. These activities received public support as part of the EU's LEADER programme (Jung et al., 2014).

Through this approach, various commercial agricultural products and services are produced, along with public goods. Typical examples include increased employment and tourism demand in the local economy, an improved regional landscape and environment, an expanded role of women in the community through their strengthened position and the creation of local knowledge. In addition, the internalization factors of yet-to-be commercialized non-products that create newly added value are premiumization through organic and high-quality production, an increase in the ratio of farmers' income through direct sales and the generation of value added through agricultural tourism.

Lastly, the public support for such multifunctional agricultural activities of farmers includes vocational education, investment support, public relations marketing, environmental direct payment and the EU's rural development policy.

3. The sixth Industrialization Movement in Korea

Korea has changed so rapidly that it is referred to as a dynamic country. Not only has it achieved great political, social and economic growth, but also significant changes took place in agriculture, though not as much as in economic growth, between the Korean War (1950–1953) and 1980 (the Semaeul movement[5]), when the main agricultural policy objectives were the mass production of food and the expansion of the rural infrastructure. From 1980 to 2000, as the economy grew rapidly, direct projects centred on subsidies became the main policy in rural areas. The subsidy policy is the main culprit behind the income inequality problem in rural society and has so far been controversial. Since 2000, as the local autonomous government (1995) was implemented, regional development, local food, social farms and auxiliary projects were promoted together, while the sixth industry was fostered from 2015.[6] In this chapter, it discuss the sixth industry policies and cases representing Korea's agriculture after 2015 as well as future changes.

[5] Saemaul Undong (movement, 1970 ~) refers to any community development movement, which builds a village or community to improve villagers' quality of life based on the spirits of diligence, self-help and cooperation, and approaches by the villagers, of the villagers and for the villagers. Saemaul Undong is also based on self-reliant decision making through the process of planning, implementation, evaluation and feedback to the next phase.
[6] Park's administration made the sixth industrial development law in 2015.

3.1 The sixth industrialization policy

In July 2013, the Ministry of Agriculture, Food and Rural Affairs of Korea promoted the sixth industrialization policy through the announcement of the 'Comprehensive Plan for the sixth Industrialization'. Firstly, the sixth industrialization model was customized for local communities and implemented through cooperation with the 'Woori nongchon' [Our Farm Village] movement. Secondly, the movement complemented the local human resource capacities with outside experts for talent donation and the return to earth movement. Lastly, it suggested means to strengthen the local networks and established support systems in the newly founded and development growth stages.

The legal basis for the implementation of the sixth industrialization movement was established on 4 May 2015, when the 'Rural Convergence Industry and Promotion Act (Sixth Industrialization Act)' was passed by the National Assembly. The definition of 'agricultural comprehensive industry (sixth industry)' in this act is 'A movement that provides a combination of resources or services to farmers and residents of the rural area who attempt to utilize production, logistics, or tourism-related, tangible and non-tangible agricultural, rural, and natural resources to generate or increase value-added'. The purpose of the act is to provide a foundation for high-value-added agriculture, to promote the development of agriculture and farming villages and to revitalize the rural economy, thereby contributing to the income growth of farmers and rural residents as well as developing the national economy (Jung et al., 2014).

The act consists of 6 chapters and 43 articles, including the establishment and implementation of the rural–urban convergence and development plan, the research and establishment of a statistical database, the certification of rural comprehensive businesses and the designation of supporting organizations and comprehensive industrial sectors. Based on these laws, the Department of Food and Rural Affairs of the Ministry of Agriculture has designated and operated intermediate-sized organizations as the sixth industrialization support centres in 9 metropolitan areas across the country. The primary functions of the support centres include certification and follow-up management of sixth industry businesses, the operation of antenna shops, the establishment of sales platforms and the investigation of the sixth industrialization businesses. By 2021, 2,054 farms had been certified, a 5% increase from 2016, 89% (1,821

farms) of which engaged in agricultural food processing, as shown in Table 3.7. This means that the Korean the sixth industrialization seems to concentrate on the food processing industry.

Table 3.7 Number of the sixth industrialization businesses by region (as of September 2021)

Region	# of certified		1st × 2nd × 3rd industry (comprehensive)	1st × 2nd industry (processing)	1st × 3rd industry (relating to tourism)
	2016	2021			
Total	960	2,045	1,459	362	224
Gangwon-do	114	185	121	40	24
Gyeonggi-do	108	210	138	21	51
Chunngcheongbuk-do	92	134	107	4	23
Chunngcheongnam-do	75	212	166	34	12
Jeonrabuk-do	144	332	185	114	33
Jeonranam-do	142	355	274	65	16
Gyeongsannam-do	98	194	144	27	23
Gyeongsanbuk-do	101	224	199	14	11
Jeju-do	59	122	68	35	19
Daegu-si	1	3	2	-	1
Daejeon-si	4	-	-	-	-
Sejong-si	12	26	17	6	3
Ulsan-si	2	9	6	1	2
Incheon-si	8	37	31	1	5

Source: Korean Ministry of Agriculture, Food and Rural Affairs, 2016–Sep. 2021.

Through the announcement of the ‘Rural Economy and Export Activation Plan in the Sixth Industrialization of Agriculture’ in 2016, the sixth industry, which has been promoted mainly for the non-farm income of individual farmers, has been developed into a regional system. This has strengthened the internal competence of agriculture by fostering professional management bodies and by actively promoting win-win cooperation between companies through the utilization of external capital and technology.

The main tasks are the following. The first is the adaptation of cutting-edge technology in agriculture, such as smart farm dissemination and the expansion of field farming and field crop communities. The second is the activation of manufacturing and processing in the food industry (expanding the use of domestic agricultural products, such as food and food service companies). The third is the efficient distribution and expansion of exports (expansion of local food stores, expansion of direct transactions and exporting of kimchi to China). The fourth is the activation of rural tourism for foreigners (attracting foreign tourists, linking free semesters, etc.). Based on these tasks, 26 of the 77 candidate items for the regional the sixth industrialization system support target were selected as priority targets, and various support measures are being prepared and promoted.

3.2. Differences between MFA and the sixth industrialization

Hans Hurni (2012[7]) in the Netherlands defined MFA is that provides one or more services using the externalities of agriculture. South Korea's approach of adding services such as direct marketing, restaurant businesses and tourism during the sixth industrialization cannot be said to be different from MFA by definition. However, when viewed from the original perspective of the agricultural industry, rather than from the industrial aspect, the biggest difference is the use of externalities, such as the MOA. The sixth industrialization aims to achieve an organic and comprehensive convergence of these industries (1 × 2 × 3 = 6) rather than simply a collection of agricultural product processing services to achieve the stabilization of farming households' economic income. This sixth industrialization can only be effective when these three parties establish a value chain relationship, and, if the primary industry disappears due to the decline of agriculture in the region, the sixth industry cannot be established (Kim Tae Gon, 2012).

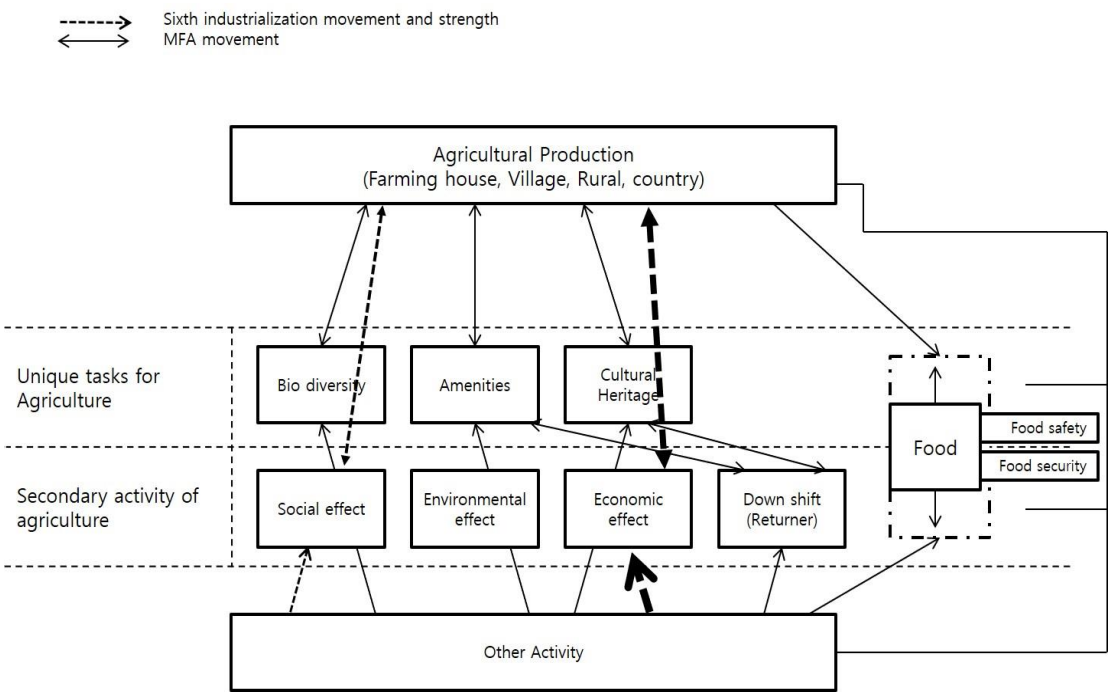

Figure 3.1 The sixth industrialization and MFA
Source: Redesigned from Romstad et al. (2002).

[7] Interview document: https://www.youtube.com/watch?v=KJ3_eYCSQNU.

MFA began with the methodological aspect of how to convert the externalities of agriculture into farm income. The sixth industrialization and MFA have common ground in seeking the diversification of agriculture as a means to create new incomes from agriculture. However, the sixth industrialization targets the generation of income for farming households through the processing and selling of agricultural products along with the restoration of the local community and short mechanization of distribution channels. Meanwhile, MFA is a wide-ranging rural development programme that seeks to create an income-generating space using local resources and space. This in turn maximizes and utilizes various natural resources (externalities) derived from agricultural production activities. Among those are environmental aspects such as rural environmental protection, the protection of rural culture, the re-creation of rural space through the diversification of agriculture and social and cultural functions such as health care and child care for people who are traumatized or affected by urbanization.

Figure 3.1 shows the difference between the sixth industrialization and general agriculture. While agriculture fulfils the basic purpose of food supply, it has a complex structure that encompasses not only unique tasks but also other social and environmental functions; meanwhile, the policy pursuit of the sixth industrialization has the large purpose of achieving an economic effect, as shown by the wide dotted arrow.

Figure 3.2 is a simplified version of Figure 3.1 MFA and the 6th industry have in common that they are based on agricultural production. However, from a consumption point of view, MFA consumes the externalities of agriculture and creates social value and environmental improvement, whereas the 6th industry is a bit different in expanding the output from agriculture to the secondary and third industry and using the external effects of agriculture appropriately. There is a difference in consumption of externality and purpose. On the other hand, Korea's 6th industrialization is trying to expand to a policy that includes external effects with a law that requires the use of both tangible and intangible resources in agriculture according to the law[8].

[8] Article 2 (3) "Rural Convergence Industry(6th industrialization)" means the service industry such as food processing, manufacturing, distribution and tourism, and related goods by using tangible and intangible resources such as agricultural products, nature, and culture in rural areas by farmers or people living in rural areas Or it refers to an industry prescribed by Presidential Decree as an industry that creates or enhances added value by providing services in a complex combination.

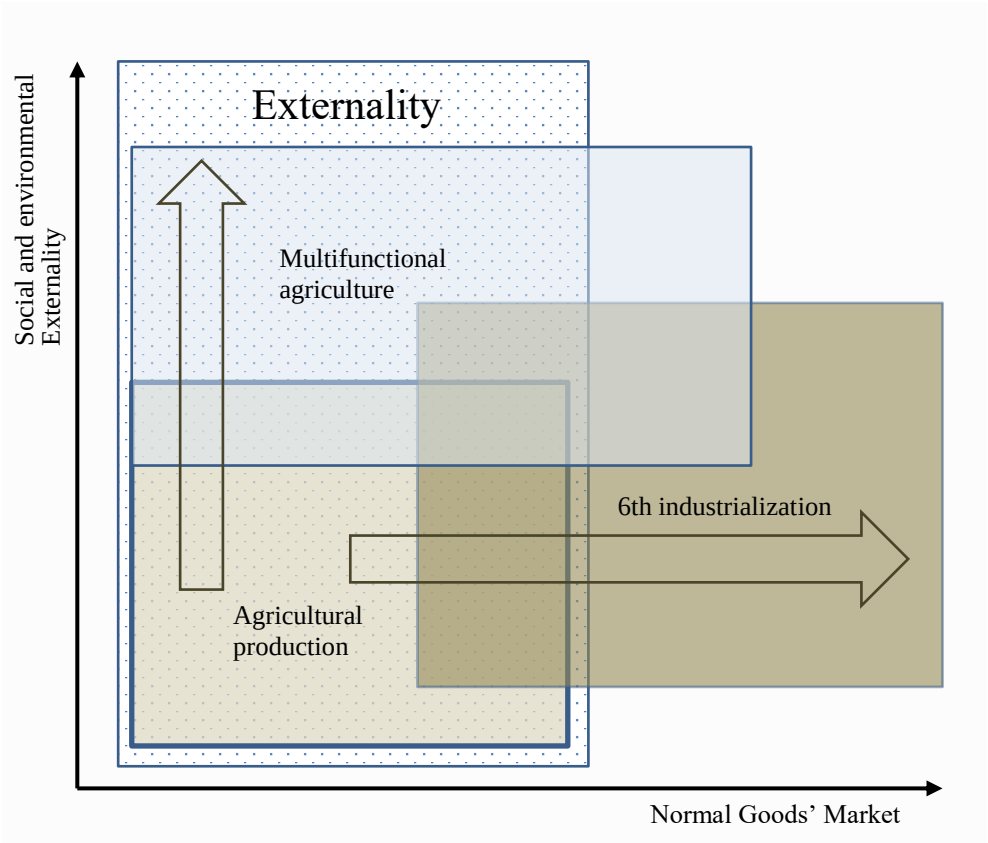

Figure 3.2 Different direction aimed by the sixth industrialization and MFA (2)

Table 3.8. and Table 3.9 show the conceptual differences between MFA and the sixth industrialization that exist in the application of multimodal functions of agriculture, such as landscape and environmental protection functions, biodiversity conservation, flood prevention and food security. While the sixth industrialization puts greater emphasis on economic functions in terms of increasing farming income rather than considering the externalities of agriculture, in the case of MFA, it is a comprehensive concept that encompasses the effects on the entire country, unlike the sixth industrialization, which mainly pursues to utilize the externalities of agriculture.

The sixth industrialization does not have regulations dictating how agricultural products must be produced, but its focus on income effects is stronger than that on externalities, in some cases, it might undermine the landscape or using chemical fertilizers in the agricultural production process. On the other hand, in the case of MFA, there will be difficult to provide MFA activities in rural areas where the rural environment is damaged, the soil is polluted by chemical

fertilizers, or the ecosystem is destroyed. Consequently, MFA is possible only when the comfort of rural areas is guaranteed, history and culture co-exist and a certain level of the environment that cannot be felt in urban areas is maintained. In other words, space should be created to enable people to escape the pollution of the city and feel the positive externalities.

Table 3.8 Differences of the effects and strategies between MFA and the sixth industrialization

Division	Effect aspects		
	Economy	Society	Environment
MFA	○*	○	◎
Sixth industrialization	◎	△	△
Division	Strategic aspects		
	Enlargement	Deepening	Regrounding
MFA	◎	◎	◎
Sixth industrialization	△	◎	△

Source: Jung et al. (2014).
Note: △ is weak, ○ is normal and ◎ is strong.

Table 3.9 Concepts and function differences between MFA and the sixth industrialization

	Sixth industrialization	MFA
Concept	Diversification of agricultural income Extending to processing and sales without staying in production	Diversification of agricultural income Eco-friendly agriculture Escape from productive farming Highlight social and environmental functions through multifunctionality
Definition	Organic fusion of primary, secondary and tertiary industries	Service industrialization of externalities derived from agricultural production activities
Economic function	Farm income increase (agricultural products, mainly sales of processed products)	Farm income increase (agricultural products, processed products, community/environmental services)
Social function	Job creation	Symbiosis with urbanites Healing Social care Community restoration Preservation of historical and cultural resources Expanding women's social participation
Environmental function	Reduction of agricultural product distribution costs through the use of local products	Resource recycling Diversification agriculture (circulation agriculture) Rural landscape recovery (important) Biodiversity conservation Water and soil protection, coping with climate change
Agricultural externalities	+, - external effects (externalities) occur	Linking positive external effects (externalities) of the service industry (business is limited in the region) with negative external effects' (externalities') occurrence)

Source: Jung et al. (2014).

3.3 Case of the Korean Sixth industrialization movement

1) Agricultural resource circulation of Chahwang

Chahwang is an affiliated farming association corporation located in Chahwang Kyoungnam province. The corporation is divided into three independently operating organizations that produce organic rice, compound feed to produce fodder from rice straw and Hanu livestock (Korean cattle). Chahwang could be called the father of eco-friendly farming in South Korea, showcasing grasshopper rice 17 years ago when the term eco-friendly farming was not yet widespread. Resource circulation is the task of one of Chahwang's many organic rice-producing corporations, producing organic rice on 350 ha of Chahwang's total 500 ha of organic rice-producing farms. It established compound feed in Sanchung-gun in 2006 to increase its income by producing assorted feed from rice straw and now produces approximately 3,500 tons of eco-friendly organic feed monthly. In 2005, it established an organization to breed Hanu in an eco-friendly manner, putting cattle out to pasture on 0.6 ha. It was certified as an organic livestock farm in 2007.

Table 3.10 Chahwang's general status (2014)

	Member	Product	Production
Resource circulation agricultural practice	150	Rice and barley	350 ha
Compound feed	61	Organic and antibiotic-free feed	Organic: 3,500 t/month Antibiotic-free: 10,000 t/month
Livestock	22	Hanu (castrated)	117

Source: Jung et al. (2014).

Analysing its business, firstly in terms of its economic effect, Chahwang's primary production of organic rice is sold at 140% of the price of ordinary rice, and the production of feed from rice straw has achieved sales worth 5 billion won annually. In addition, 117 Hanu raised following an eco-friendly method have been sold at 145% of the price of regular Hanu, contributing to the profit of the farms. They further increased their income by effectively circulating by-products, utilizing rice straw as feed for cattle and livestock faeces as fertilizer for farming.

Secondly, Chahwang's business yields positive environmental effects due to its eco-friendly farming methods for growing rice and barley and raising cattle. They help to protect the ecosystem in the area, preserving the biodiversity of species. In particular, Chahwang's pasture, while not large in total area, enhances animal welfare as well as the scenery. The utilization of agricultural by-products, such as rice straw and cattle faeces, not only reduces the business costs but also circulates resources effectively and therefore contributes to environmental protection.

Thirdly, Chahwang creates social effects by advertising its environmentally friendly and safe food production methods to the public as well as creating jobs and revitalizing the rural community. By advertising its business success to other farming businesses, it may encourage more farms to adopt eco-friendly and resource-circulating farming methods in anticipation of better economic success.

Table 3.11 Chahwang's MFA effective aspects

	Effects
Economic	- Increased income from high-quality organic produce - Transforming rice straw into fodder - Composting of manure
Environmental	- Ecosystem conservation - Improvement of amenities - Resource recycling (conservation agriculture) - Animal welfare - Water quality protection
Social	- Job opportunities - Community revitalization - Safe food

Source: Jung et al. (2014).

Evaluating Chahwang based on the three strategy categories of regrounding, deepening and broadening suggested by van der Ploeg and Roep (2003), the production of high-value products of eco-friendly organic rice and high-quality Hanu while shortening the distribution process via direction transactions could be referred to as deepening, which increases the income overall. In terms of regrounding, processing rice straw into feed for cattle and utilizing livestock faeces in fertilizer for farming circulate the by-product resources, contributing to the deepening of agriculture. The broadening strategy in terms of MFA, which is the last strategy, contains various related service industries. If agriculture is not deepened and restructured, a continuous broadening strategy may not be sustainable. So far, Chahwang has based its business strategy mainly on production-based agriculture, which can be classified as deepening and regrounding,

while mostly lacking aspects of broadening. However, it could improve this aspect by increasing the area of its pasture, further improving the scenery and establishing a direct outlet for its products.

Table 3.12 Chahwang's MFA strategy aspects

	MFA	Lack of MFA
Regrounding	- Livestock manure composting - Turning rice straw into fodder - Circular agriculture - Joint use of agricultural machinery	
Deepening	- Organic rice - Organic Korean beef (realization of animal welfare) - Production of high-quality agricultural products (income 140% of the customary agricultural prices) - Celebration of the agricultural cycle through diversification - Increasing the income by simplifying the distribution structure	
Broadening		- Need to expand the scale of grassland - Rural education and experience required on organic farmland - Need for social welfare activities in connection with social enterprises and welfare projects - Finding ways to utilize the external effects generated from organic farmland and livestock pasture - Direct market and restaurants

Source: Jung et al. (2014).

The Chahwang Resource Circulation Agricultural Corporation is a form of production-oriented agricultural corporation in which three corporations are linked. Starting with eco-friendly rice production, rice straw is used to produce feed, the feed is used again for raising Korean Hanu cattle and the manure excreted by the Korean cattle is returned to the soil. These activities can be said to achieve economic functions through changes in agricultural production methods resulting from the deepening and reorganizing of MFA. What is lacking is an enlarged part, and it is necessary to find a way to utilize the natural scenery of the pleasant green environment. Since the eco-friendly resource circulation farming method can produce great educational effects on children, it is possible to explore ways to open educational farms and camps, and it is also worth considering treatment and care services for autistic children. If Chahwang operated an educational farm or a care farm, it would be able to create a tourist attraction nearby and run a programme for parents. In addition, if a direct market was opened

and the service plan was expanded so that parents could purchase Korean beef, rice and other agricultural products of Chahwang, the direction of development as MFA would be very large. However, regarding the deepening and regrounding, it is difficult to expect the landscape effect due to the small size of the grassland, and the surrounding facilities seem far from rural. In addition, the fact that formulated feed factories, which have higher sales than rice agriculture and can be said to be the parent company of corporations, are being activated may work as a negative factor in expanding the service industry in the future.

In regard to the MOA, Chahwang could improve its income by establishing relaxation facilities, experience programmes, tourism or direct sales based on the beautiful scenery formed by the eco-friendly agriculture and wide pastures. With its solid foundations in improving the scenic value and the environment, Chahwang's business and economic success is expected to grow continuously in the future.

2) Hadong wild green tea region

Hadong[9] is an area famous for its tea production, which dates back to the Silla period (57 BCE–935 CE) and is one of the major tea plantation sites in South Korea. The wild tea plantations of Hwagye-myun are mostly scattered across the hillsides of the canyon along Hwagye-cheun, and the small area per plantation on the difficult terrain necessitates manual harvesting. As a result, handmade high-grade tea makes up more than 95% of the production, and relatively less than 5% consists of mass-produced tea.

The active aid from the local government as well as the well-being craze that began in the 1990s led to more than 400% growth in the green tea industry by the mid-2000s (Park et al., 2008), and Hadong was the leading region for high-grade green tea production in the country. However, the explosive spread of coffee and café culture as well as the pesticide tea crisis caused the country's green tea industry to shrink to nearly half the size by 2007. Consequently, Hadong's wild tea industry suffered and the total area of tea plantations and the number of tea gardens in Hadong rapidly decreased to only 168 businesses today. Recently, various attempts have been made in many regions across the country to overcome this depression in the tea

[9] A synonym for tea grown in a wild way in the deep valley of Mt Jirisan.

industry, and many of them are related to the utilization of the MOA.

The first was the diversification of the products based on the re-evaluation of the traditional culture. Until the mid-2000s, it was mostly considered that the major historical tea culture in Korea revolved around green tea. Therefore, Hadong's tea plantations mainly focused on the production of green tea. However, the reinterpretation of historical documents in 2008 as well as the collection of oral statements from native people (Jang, 2012) suggested that Korea's traditional tea culture involved fermented tea. This resulted in the production of fermented tea, such as black tea and yellow tea, at the tea gardens in the Hadong area. As of today, almost all medium- and small-scale tea gardens produce fermented tea in addition to their green tea. This re-evaluation diversified the types of tea, which were classified based on their cultivation methods – wild green tea, non-wild green tea, hand-grafted green tea and non-hand-grafted green tea – and their harvest season – Woojeon, Sejack and so on. These diversified teas helped to address the stereotype that green tea is bad for acidic stomachs, improving the overall income of the tea business.

Second, the utilization of the MOA can be found in the producers' effort to collaborate with fieldwork programmes and relaxation programmes. In the past, the only experience programme for customers consisted of sampling events for regular customers, at which they could taste the tea produced and processed by the tea gardens. However, recently adopted programmes allow the customers to experience the harvesting and processing at the tea plantations and even include tea processing programmes. The customers can taste the tea that they have harvested and processed themselves, gaining valuable experience and entertainment. Furthermore, with the recent healing craze, many tea businesses offer healing culture experience programmes, combining their tea experience programmes with other forms of relaxation, such as yoga and meditation. This type of newly combined business is especially widespread in Hadong-gun Akyang-myun, which was designated as a slow city in 2009.

Third, various efforts have been made by the tea businesses in the area to perform joint work projects and to build a cooperative system. In the past, Hadong's tea industry took the form of independent businesses in each tea garden, which purchased tea, processed it and sold it to customers. However, after the crisis in the tea market, the medium- and small-sized tea gardens began to collaborate and cooperate in various ways to overcome the depression. One particular

effort was the building of a village-wide cooperative system. To diversify and improve the village, to attract visitors, they built experience centres to provide various programmes and accommodation, which are run and shared by the tea gardens in the village. Moam Organic Tea Town Association runs the Green Farming Villages – Experiencing Towns Project, which involves 60 farmhouses in the village that offer experience centres and accommodation as well as advertising the area to attract visitors. Another form of cooperative effort is the formation of a cooperative association of tea gardens. As small and medium-sized tea gardens struggled to maintain their businesses, they formed a cooperative association to showcase the distinctive features and strengths of individual tea gardens. For example, Dao Food, which has strengths in the development of tea-related processed food and the sale of such products, cooperates with five tea experts in Hadong to form the Danong Coop and aims to sell handmade tea bags to popularize the tea culture.

Fourth, many tea gardens are making efforts to preserve the environment and switch to organic farming. The area is near the Jirisan National Park, and therefore the preservation of the environment and the scenery is inevitable. Recently, many businesses have begun to take advantage of this geographical uniqueness to advertise and sell premium-grade organic tea.

When the case of Hadong's wild tea plantation business is evaluated in terms of regrounding, deepening and broadening strategies, the diversification of tea types and the development of various tea-related processed goods or the implementation of direct selling to customers can be classified as a deepening strategy. In addition, the operation of experience programmes and related relaxation programmes and tourism attractions by the tea gardens could be seen as a broadening strategy. Lastly, the transition to organic production and the efforts to preserve the scenery fall into the category of a regrounding strategy.

Table 3.13 Hadong green tea region's MFA strategy aspects

	MFA	Lack of MFA
Regrounding	- Efforts to convert to organic tea - Efforts to preserve the landscape	- Organizational landscape/environment conservation activities
Deepening	- Direct sales efforts (individual) - Efforts to develop various processed products - Efforts to diversify products into fermented tea	- Establishment of a joint direct sales store - Synergic effect with special products other than tea
Broadening	- Efforts to diversify activities such as experience, healing, restaurants and tourism	

Source: Jung et al. (2014).

In conclusion, Hadong's wild green tea plantation industry pursues the utilization of the MOA. For a long time, the entire process of production, processing and selling of the tea product took place in individual tea gardens, and recently the economic activities of these tea gardens have been growing to become diversified and collaborative. In addition to their economic improvement, they have been attracting public attention due to their social and environmental activities. These activities have emerged as part of their efforts to save their own businesses and therefore are expected to continue in the future. However, there are further efforts that could be made to improve the tea business. The establishment of a collaborative direct outlet, which is currently being discussed, may enhance the deepening, and further collaboration with other kinds of agricultural products and regional specialities may show synergy. Additionally, more effective and organized efforts for the preservation of the environment and the scenery need to take place.

3.4 Recent Movement to social and care farm programmes

The term MFA is not used in agriculture in South Korea. The Ministry of Agriculture, Food and Rural Affairs (MAFRA) has jurisdiction over South Korea's agriculture, the Rural Development Administration (RDA) is the sub-organization that supports agricultural technology and the Korea Forest Service is the other sub-organization that supports mountain villages and forests. South Korea is a capitalistic nation with a competitive society. There is competition among the government's internal organizations, and this often leads to a lack of communication among different organizations.

South Korea's MFA started in 2015 when the sixth industrialization policy was legislated by MAFRA, and approximately 5 million USD[10] is invested in this policy annually. In 2018, MAFRA began a social farm pilot project. In addition, the RDA led the passing of the care farm law in Congress in 2021, which selected this year's care farm training institutions, established the Care Farm Spread Center in Kyoungnam province and plans to begin training care farmers in the second half of the year and to establish and administer quality certification in care farms

[10] MAFRA has designated support centres in 11 regions and provides about 500,000 USD.

by next year.

The social farm was developed in Italy by Fazzi (2011) in the form of a social cooperative, which adopted a new approach to developing the traditional rural economy while serving the local-level interests of the social inclusion and rehabilitation of disadvantaged people. South Korea's social farms aim to support the employment and self-support of disadvantaged people and their social integration as well as community vitalization and job creation. The government provides a maximum of 50,000 USD to support the designated social farm network programme, the relaxation facility management fee and renovation fees for facilities for disadvantaged groups. In 2021, approximately 60 farms were designated.

4. Conclusion

This chapter presented the necessity of agricultural policy change and direction in the cases of MFA in the EU and Korea. The sixth industry movements in Asian countries were compared through policies and cases. The results suggest that, while the EU MFA is a policy theme concentrating on circulation that encompasses nature, the environment and the eco-system, the Asian sixth industrialization and movement focus on the income value added through farm production and the introduction of direct sales into the agricultural secondary industry (such as the food industry and food processing). It has been shown that Korean food processing accounts for 92% of the entire sixth industry among certified farmers in Korea.

Korea's income- or economic effect-oriented system causes uniform or vertical problems, such as similar types of MFA being promoted competitively among organizations due to the intensifying competition, even in the government that makes the policies, or similar policies being promoted with only a change of name. Therefore, farm owners can obtain subsidies from various government entities, protect the environment, achieve high sales and contribute to the local economy. This is causing the problem of polarization.

Chapter 4 A Review of Environmental Goods Valuation Methods

1. Introduction

Economists have focused on the social value of public goods that do not have a market price, such as environmental goods. Such an idea was first presented by Ciriacy-Wantrup in 1947. This study showed that the value of public goods can be assessed through surveys.

Value assessment through surveys has been taboo among economists since 1947. Samuelson (1954) proved in his study that surveys do not reflect personal interest (demand), and Davis (1963) conducted research in which Ciriacy-Wantrup's survey method was used in a bidding game to determine whether hunters are willing to pay for a pathway in the woods, which became a model for the CVM for public value assessment. The CVM was later modified with new techniques, such as the billing model, and open questions to assess public value effectively by estimating compensation variation (CV) and equivalent variation (EV).

However, the CVM is not without its limitations. It is useful for assessing public value as a whole but is not appropriate for estimating multi-attribute values. For instance, when the value of a car is estimated, a customer will include various attributes, such as the brand, design, convenience and quality, rather than a single attribute. A choice experiment (CE) resolves such issues by suggesting various policies with specific goals and their costs to the respondents and asking them to choose their most-preferred combination. The CE method, therefore, holds several advantages over the CVM in that a CE can estimate a multitude of utilities and can include environmental variables to assess environmental attribute values. Furthermore, even for analyses that are difficult to quantify, such as water quality difference, although virtual, CE is applicable. This chapter covers various examples of CV and CE methods and their differences to assess the value of MFA later.

2. General valuing measurement for environmental goods

Environmental goods, such as the multifunctional uses of agriculture or non-market goods utilizing the environmental amenities of agriculture as commodities, are representative non-market goods that do not have a market price due to direct transactions or consumption in the

market (Lee, 2009). In economics, the value of goods is based on the ability to meet human needs and desires or the ability to increase each individual's welfare or utility; thus, the economic value of environmental goods is the extent to which ecological functions and services of environmental resources contribute to human welfare (Freeman, 2003:7).

Individuals' welfare change is measured by observing their choice of goods and services. If an individual chooses *A* between Product *A* and Product *B*, this means that *A* gives higher satisfaction than *B* and the market has preferences for Product *A*. It can be assumed that this preference has substitutability and means that it is possible to maintain the individual's well-being by increasing the amount of one element if the amount of another element in the product combination decreases. The economic concept of value becomes the key to exchange activity because it creates exchange rates among the related goods. The amount of money that must be given up purchasing a unit of one element among certain product combinations becomes a surrogate variable for the purchase amount of other components, which should be reduced (Freeman, 2003:46).

The measure of value based on this substitutability includes a WTP method that measures the maximum payment allowance that an individual would like to pay for changes in the environment and a WTA method in which an individual requires minimum compensation instead of giving up on improving the environmental quality.

In 1976, Willig's study developed a method for measuring the value of non-market goods by estimating consumer surplus as an approximation of the CV and EV and was widely used in business administration until recently. However, in the case of environmental goods or resources and not the price changes of market goods, it is difficult to apply them because there is no market price in estimating value. Therefore, a measurement of changes from environmental destruction to restoration or further improvement forms should be made. The valuation of changes in environmental goods can be estimated through compensation surplus (CS) or equivalent surplus (ES) (Lee, 2009) to complement this.

The utility function of an individual's consuming environmental goods is $u(\boldsymbol{x}, \boldsymbol{q})$. $\boldsymbol{x}$ is the vector for the number of market goods, and q is the vector for the volume of environmental resource services. Additionally, p and r are price vectors of x and q, respectively, and individuals have budget constraints of $px + rq = m$. Here, because q is generally an

exogenously given value, the conditional demand function for market goods is as follows:

$$x_i = x_i(p, m - rq, q) \tag{4.1}$$

Furthermore, if (4.1) is added to the utility function and expressed as a conditional indirect utility function v, it is the same as equation (4.2).

$$v = v(p, m - rq, q) \tag{4.2}$$

When equation (4.2) is expressed as an issue of minimization of expenditure, as shown in equation (4.3), p and q are given as expenditure functions and the minimum amount of expenditure on market goods required to achieve utility margin u.

$$e^* = m - rq = \ e^*(p, q, u) \tag{4.3}$$

Alternatively, the equation may be expressed as the total expenditure on all goods, including q, that is necessary to obtain the utility level of u^0 with the given p, r and q.

$$e = e(p, r, q, u^0) \tag{4.4}$$

e^* and e are related to $e = e^* + rq$, and, when $r = 0$, these two types of expenditure functions match. CS refers to the income change required to achieve the original utility level u^0 under the new level of environmental conditions q^1 obtained after the change in environmental goods, and ES refers to the income change required to obtain utility level u^1 obtained after the change in environmental goods with the original environmental condition q^0. Thus, if an indirect utility function is used, CS and ES can be defined as the expenditure function, as shown in Expressions (4.7) and (4.8).

$$v(p, m - rq^0, q^0) = v(p, m - rq^1 - CS, q^1) \quad (4.5)$$

$$v(p, m - rq^0 + ES, q^0) = v(p, m - rq^1, q^1) \quad (4.6)$$

$$CS = e(p, r, q^0, u^0) - e(p, r, q^1, u^0) = m - e(p, r, q^1, u^0) \quad (4.7)$$

$$ES = e(p, r, q^0, u^0) - e(p, r, q^1, u^1) = e(p, r, q^1, u^1) - m \quad (4.8)$$

3. Several valuation methodologies for environmental goods

3.1 Contingent valuation method (CVM)

The CVM is widely used in dichotomy choice questionnaires in which respondents answer 'Yes' or 'No' to the proposed amount. Bishop and Heberlein's (1979) single-boundary model and Hanemann's (1984) double-boundary model are representative of the two-choice questioning method. The single-boundary model is easier to carry out, but it is statistically inefficient and requires a large number of samples (Kim et al., 2014). These techniques allow the estimation of the value through a quantification process because the respondent does not offer a WTP for the environmental product but rather answers only 'Yes' or 'No' (Kwon, 2005).

If environmental improvements are offered in a survey conducted with individual *j* but the requirement is to pay as much as t_j, the question is whether the individual is in favour of the plan. If the characteristics other than the income of this individual are s_j and the income is m_j, the satisfaction of this individual may be expressed through a variable probability expression (4.9) if the environmental improvement is not achieved.

$$u_{0j} = v_{0j} + \varepsilon_{0j} = a_0 s_j + \beta m_j + \varepsilon_{0j} \quad (4.9)$$

ε_{0j} is a probability variable that the researcher cannot know Similarly, the satisfaction with paying the cost and improving the environment can be expressed in equation (4.10):

$$u_{1j} = v_{1j} + \varepsilon_{1j} = a_1 s_j + \beta(m_j - t_j) + \varepsilon_{1j} \quad (4.10)$$

Therefore, the respondent is in favour of the plan for environmental improvement if $u_{1j} > u_{0j}$. If the difference between the two probability values is determined as $\varepsilon_j = \varepsilon_{1j} - \varepsilon_{0j}$ and the difference in the utility function excluding the probability variable is $\Delta v_j = v_{1j} - v_{0j} = (\alpha_1 - \alpha_0)s_j - \beta t_j = \alpha s_j - \beta t_j$, the probability that the person will approve it can be shown as equation (4.11):

$$\Pr(yes) = \Pr\left(\alpha s_j - \beta t_j + \varepsilon_j > 0\right) = 1 - \Pr\left(\varepsilon_j < \alpha s_j - \beta t_j\right) \tag{4.11}$$

To obtain parameters α and β of the utility function from equation (4.11), the specific analysis depends on the distribution that the probability variable ε follows, which is assumed to be normal distribution with a mean of 0 and a variance of σ^2 when using the probit model in econometrics. Therefore, when another probability variable $\theta = \frac{\varepsilon}{\sigma}$ is defined, it will follow the standard distribution. If Φ is marked along with the cumulative distribution function of the standard normal distribution, the probability that respondent *j* will eventually agree to the plan is expressed as follows:

$$\Pr(yes) = \Pr\left(\varepsilon_j < \alpha s_j - \beta t_j\right) = \Phi\left(\frac{\alpha s_j}{\sigma} - \frac{\beta}{\sigma} t_j\right) \tag{4.12}$$

When a survey of amount *M* is conducted, and I_j is set as a variable with a value of 1 if the *j*th person agrees to it and a value of 0 if he or she disagrees, the following is a likelihood function that reflects all of the responses:

$$L = \prod_{j=1}^{M} \left[\Phi\left(\frac{\alpha s_j}{\sigma} - \frac{\beta}{\sigma} t_j\right)\right]^{I_j} \left[1 - \Phi\left(\frac{\alpha s_j}{\sigma} - \frac{\beta}{\sigma} t_j\right)\right]^{1-I_j} \tag{4.13}$$

The maximum likelihood estimation aims to obtain a parameter that maximizes the above likelihood function. On the other hand, when applying a technique called a logit model, it is

assumed that the probability variable ε follows a logistic distribution with a mean of zero and a variance of $\frac{\pi^2}{3}$. In this case, the probability that the respondent will approve is known as $\Pr(yes) \equiv \Pr\left(\varepsilon_j < \alpha s_j - \beta t_j\right) = \frac{1}{1+\exp\left(-(\alpha s_j - \beta t_j)\right)}$, which results in the following likelihood functions (Kwon, 2003):

$$L = \prod_{j=1}^{M} \left[\frac{1}{1+\exp\left(-(\alpha s_j - \beta t_j)\right)}\right]^{I_j} \left[1 - \frac{1}{1+\exp\left(-(\alpha s_j - \beta t_j)\right)}\right]^{1-I_j} \tag{4.14}$$

From the estimates of parameters obtained through the above procedure, the WTP for environmental improvements can be derived. By definition, the WTP should be CS_j to meet the following:

$$\alpha_1 s_j + \beta\left(m_j - CS_j\right) + \varepsilon_{1j} = \alpha_0 s_j + \beta m_j + \varepsilon_{0j} \tag{4.15}$$

Converting (4.15) into CS_j, it is $CS_j = \frac{\alpha s_j}{\beta} + \frac{\varepsilon_j}{\beta}$, where $\alpha = \alpha_1 - \alpha_0$ and $\varepsilon_j = \varepsilon_{1j} - \varepsilon_{0j}$. Thus, the WTP becomes a probability variable itself. Normally, the mean or median value of CS_j is obtained, and, if ε is distributed symmetrically relative to the origin, the mean and the median values are matched by $E\left(CS_j\right) = \frac{\alpha s_j}{\beta}$.

3.2 Random willingness-to-pay model

A probability utility model, such as the CVM described above, is an analysis method established by Hanemann (1984). Cameron and James (1987) proposed another approach called the random willingness-to-pay model, which defines a function of payment directly without going through a utility function and assumes that the willingness-to-pay function includes the individual's characteristic variable as well as other variables that are not observable, similar to the probability variable (Kwon, 2003). In other words, η_j is the probability and γs_j is the observed variable in the assumption $CS_j = CS_j\left(s_j, \eta_j\right) = \gamma s_j + \eta_j$. Thus, Kwon (2003) set the

probability that individual *j* will agree to the proposed environmental improvement programme as follows (4.16):

$$\Pr(yes) = \Pr\left(CS_j > t_j\right) = \Pr\left(\gamma s_j + \eta_j > t_j\right) = 1 - \Pr\left(\eta_j < \gamma s_j - t_j\right) \quad (4.16)$$

If η_j follows a normal distribution with a mean of 0 and variance of σ^2, another probability variable $\frac{\eta_j}{\sigma}$ also follows the standard normal distribution, so the probability of approving the proposal is equal to $\Phi\left(\frac{\gamma s_j}{\sigma} - \frac{1}{\sigma} t_j\right)$, which can further be used to derive the likelihood function and the corresponding best estimate of the parameter. Assuming a symmetrical distribution of the probability variable, the average payment willingness is $E\left(CS_j\right) = \gamma s_j$. However, since the estimated parameters are $\frac{\gamma}{\sigma}$ and $-\frac{1}{\sigma}$, these estimates are substituted to calculate the average payment willingness as $\frac{\gamma/\sigma}{1/\sigma} s_j$.

Comparing the consent probability $\Phi\left(\frac{\gamma s_j}{\sigma} - \frac{1}{\sigma} t_j\right)$ of the probability payment model with the consent probability of the probability effectiveness model $\Phi\left(\frac{\alpha s_j}{\sigma} - \frac{\beta}{\sigma} t_j\right)$, one can see that the two have the same structure but different meanings of the estimated parameter. Thus, McConnell (1990) concluded that, under the voting model, these two approaches would result in the same analysis. However, in a different kind of statement preference model from a voting model, these two approaches play different roles. The probability payment model can be used in the dual voting model described below but the probability effectiveness model cannot. On the other hand, the probability effectiveness model can be used in the other way, but the probability payment model cannot be used in the optional experiment model described below.

3.3 Double-bounded dichotomous choice method

The contingent valuation method (CVM) is one of the standard approaches for valuing non-marketed resources, such as recreation, wildlife and environmental quality. Initially, a bidding format was used to elicit WTP (Randall et al., 1974). On the other hand, the CVM is an open-ended method, as presented above, that can respond to an amount less or greater than the actual

value, unlike the situation when inquiring about the intention to pay for the goods in the virtual market. The double-bounded dichotomous choice method was developed to resolve this error.

The double-bounded dichotomous choice method aims to show how the statistical efficiency of the dichotomous choice CVM can be improved by asking respondents to engage in two rounds of bidding: participants respond first to a dollar amount and then face a second question involving another dollar amount, higher or lower, depending on their response to the first question. This double-bounded CVM approach was first proposed by Hanemann (1985) and Carson (1985) and first implemented by Carson et al. (1985), (Hanemann et al., 1991).

The double-bounded dichotomous choice method suggests the same situation as when the consumer purchases the goods by asking the respondent to answer 'Yes' or 'No' regarding the WTP for environmental goods and estimates it by substituting the result of this bilateral response into a probability curve (Han, 2007). This approach can minimize the cognitive burden that makes respondents think about the actual amount (Boyal et al., 1994). The double-bounded dichotomous choice method is divided into the bivariate dichotomous choice model introduced in 1994 by Cameron and Quiggin and the internal data model presented by Hanemann et al. (1991), depending on how the estimation model is established.

According to the internal data model of Hanemann et al. (1991), the vertical axis of the logarithmic curve means the probability of these double responses and can be expressed as π. Respondent i responds 'Yes' to the first question for the first amount of B^S and for the second amount B^U. The probability of answering 'Yes' is π^{yy}, 'Yes' and 'No' is π^{yn} and 'No' is B^S, and, with the second smaller amount B^L, the probability of answering 'Yes' is π^{ny}. When the probability of responding 'No' is called π^{nn}, the probability function can be expressed as follows (4.17) (Hanemann et al., 1991):

$$\pi^{yy}(B^S, B^U) = \text{Porb}\{B_i^U \leq \text{maxWTP} \leq \text{income}\} = 1 - \text{G}(B_i^U;\ \theta)$$

$$\pi^{yn}(B^S, B^U) = \text{Porb}\{B_i \leq \text{maxWTP} \leq B_i^U\} = \text{G}(B_i^U;\ \theta) - \text{G}(B_i;\theta)$$

$$\pi^{ny}(B^S, B^L) = \text{Porb}\{B_i \leq \text{maxWTP} \leq B_i^L\} = \text{G}(B_i;\ \theta) - \text{G}(B_i^L;\theta)$$

$$\pi^{nn}(B^S, B^L) = \text{Porb}\{B_i \geq B_i^L \geq \text{maxWTP}\} = \text{G}(B_i^L;\theta) \quad (4.17)$$

This probability function can be expressed as a log-likelihood function, as shown in equation (4.18):

$$\ln L^{D}(\theta) = \sum_{i=1}^{N} \begin{bmatrix} d_i^{YY} ln\pi^{YY}\left(B_i, B_i^U; \theta\right) + \; d_i^{YN} ln\pi^{YN}\left(B_i, B_i^U; \theta\right) \\ +d_i^{NY} ln\pi^{NY}\left(B_i, B_i^D; \theta\right) + d_i^{NN} ln\pi^{NN}\left(B_i, B_i^D; \theta\right) \end{bmatrix} \tag{4.18}$$

The economic benefit CV can be estimated through the log-likelihood function using the integration method by Hanemann (1984).

3.4 Choice experiment method (CE)

The choice experiment (CE) method provides respondents with a policy aimed at achieving different levels of environmental quality and the cost of carrying out each policy and elicits their most-preferred combination of these various policies and the cost combinations (Kwon et al., 2007; Jung, 2014).

The choice experiment method has several advantages over the CVM when assessing a change in the state of environmental goods. Although the CVM can only compare the current and the improved conditions of the environmental good, the choice experiment method allows the benefit of different levels of environmental quality to be estimated by level, and the value of each variable characteristic can be estimated by simultaneously adding variables that act to change the condition of the environmental good when constructing the combination. In other words, the choice experiment method is not an actual selectable alternative but a discrete choice model that creates and selects a hypothetical situation.

If the environmental goods are expressed by vector x, it contains both the level value of each attribute and its cost. Equation (4.19) indicates the satisfaction of the *m*th respondent by choosing the *n*th alternative if *N* of the alternatives is presented.

$$u_{mn} = \beta x_{mn} + \varepsilon_{mn} = v_{mn} + \varepsilon_{mn} \tag{4.19}$$

If the probability variable ε_{mn} follows the distribution of the first type I extreme value, the probability of the *m*th respondent choosing the *n*th alternative is shown in Equation (4.20), and it is possible to obtain β as the top estimate.

$$\frac{\exp(\beta x_{mn})}{\sum_{k=1}^{N}\exp(\beta x_{mk})} \tag{4.20}$$

Considering a model that is not based on the assumption that each environmental good is continuous, there may not be an increase in people's welfare proportionately at each attribute level, so dummy variables can be used to estimate the coefficients of non-continuous variables. Equation (4.21) shows an estimation equation using dummy variables:

$$u_{mn} = \beta_{\mathrm{t}}A_{\mathrm{j}} + \beta_{\mathrm{e}}B_j + \beta_{\mathrm{h}}B_j + \beta_{\mathrm{l}}B_j + \beta E + \varepsilon_{nj} \tag{4.21}$$

If there is no WTP for the *n*th alternative, then the satisfaction achieved is as shown in Equation (4.22).

$$v_{mn} = \beta_{m0} + \varepsilon_{mn} \tag{4.22}$$

If the estimated utility function in equation (4.22) preserves the environmental goods level, the WTP for multifunctional preservation can be estimated by determining whether satisfaction v_{mn} maintains the same value. This approach has the problem of not considering the probability variable ε_{mn}, but it is a solvable problem when applied to actual selection problems. After all, assessing the value of environmental attributes should involve subtracting from the value after the change to the benefit before the change. In other words, if the utility value before the change is and the value after the change is v_{mn}^{1} , the formula for estimating the benefits per individual can be provided by equation (4.23) which requires an assumption of the error components with type I extreme values and the fixed marginal income by the attributes change. An estimated I parameter can be applied to the actual entity to estimate its economic value as a result of the

change. However, only the value of a unit change can be estimated because the multifunctional value before changing is unknown (Kwon, 2007; Kwon et al., 2007; Jung, 2014).

$$\frac{1}{\beta_t}[\ln \sum_{n=1}^{N} \exp(v_{mn}^0) - \ln \sum_{n=1}^{N} \exp(v_{mn}^1) \tag{4.23}$$

The CE is an alternative model (a multiple comparative model) to two comparative CVM voting models. It is a discrete choice model similar to a probability utility model, in which a range of virtual alternatives is selectable. Supposing that the satisfaction rate of individual *n* choosing the *j*th alternative forms a linear function, it can be expressed as equation (4.24) in a random utility model (RUM).

$$U_{nj} = V_{nj} + \varepsilon_{nj} = \beta X_{nj} + \varepsilon_{nj} \tag{4.24}$$

where: U_{nj} is the utility function when respondent n selects the *j*-th option (j=(i,…,J);
V_{nj} is the property when respondent *n* selects the *j*-th option;
X_{nj} is the presumable property when respondent *n* selects the *j*-th option;
ε_{nj} is a random variable.

Subjects will seek an alternative that can maximize their satisfaction, depending on the MFA conditions, and select the one that is close to the desired χ_{nj}, β and ε_{nj}. On the other hand, researchers have to analyse the choice behaviour with only choice χ_{nj} being known. Assuming that the random variable follows the type I extreme value distribution, the probability of individual *n* choosing alternative *j* is indicated in equation (4.25), and β can be estimated through the maximum likelihood estimation model.

$$P_{nj} = \frac{\exp(V_{nj})}{\sum_{j=1}^{J} \exp(V_{nj})} = \frac{\exp(\beta' x_{nj})}{\sum_{j=1}^{J} \exp(\beta' x_{nj})} \tag{4.25}$$

where: P_{nj} is the probability that respondent *n* will choose option *j*.

4. Conclusion

As explained above, the contingent valuation method (CVM), double-bounded dichotomous choice method, probability payment method and choice experiment method can be considered as methods for estimating the value of environmental goods. These methods are representative stated preference methods that evaluate the value of non-market goods and have the advantage of being able to evaluate individual CS or ES directly by estimating the changes in consumer surplus obtained from the consumption of non-market goods. The CVM, developed by Ciriacy-Wantrap (1994), is a simple method of evaluating the intention to pay by directly asking for a 'Yes' or 'No' answer, while the evaluation requires only one to be evaluated, and the response of the respondent has a large effect on the result. The probability payment method is the same as the CVM but is a model that analyses the respondents' payment intention in the form of a kind of random variable. There is a difference between before and after the procedure. The double-bounded dichotomous choice method is a way of reducing the error of CVM respondents' payment intention, presenting and eliciting responses to two or more cards, and confirming their payment intention by conducting this procedure several times.

The choice experiment (CE) method provides respondents with a policy aimed at achieving different levels of environmental quality, the cost of carrying out each policy and the most-preferred combination of these various policies and costs (Kwon, 2007). The choice experiment method has several advantages over the CVM when assessing the change in the state of the environmental goods. Although the CVM can only compare the current and the improved conditions of the environmental good, the selective experiment method offers the benefit of estimating different levels of environmental quality by level, and the value of each variable characteristic can be estimated by simultaneously adding variables that act on changing the condition of the environmental good when constructing the combination.

For the valuation of multi-variables of environmental goods, as used in this study, the CVM and the double-bounded dichotomous choice method are relatively easy to investigate compared with the CE. However, when several investigations are conducted and combined into a single subject, the likelihood of over- and underestimation issues rises. Therefore, to analyse the multi-functions of rural villages and the value of various attributes of MFA in a single model, the CE

method, which can measure each part’s worth by attribute, is suitable.

Chapter 5 An Evaluation Analysis of the MOA

1. Introduction

In 1995, Korea joined the World Trade Organization (WTO), starting with a Free Trade Agreement (FTA) with Chile (2004), followed by ones with the EU (2011), Australia (2014), the United States (2017) and the United Kingdom (2021). As negotiations have been completed with 17 countries, the food production function of agriculture, which is less competitive than the manufacturing industry, is being threatened, and there is concern about even more overseas agricultural products' encroachment into the domestic agricultural product market in the future. To achieve a breakthrough in this situation, the central government and local governments are actively discussing new policy directions for rural development, and, under the policy of regional activation and regional balanced development, comprehensive agricultural programmes, such as the sixth industrialization along with rural tourism, regional festivals and rural development, are being promoted, especially in food processing. The aim is to cope with the era of openness through the revitalization of the rural economy. However, due to the progress of urbanization in rural areas, indiscriminate development and intensification of regional competition, it has been criticized for being uneven and not consistent and for not considering the characteristics of rural areas.

Rural areas have been regarded as the centre of the primary industry in the past. However, rural areas create not only agricultural products but also various MOA, and compensation for this has not been adequately achieved. In these rural areas, there are many resources that need to be conserved.

In this chapter, the contents of the MOA in Korean rural villages, which can be described as a symbol of rurality, environmental resources, history and culture, social public activity and landscape, will be examined. The attributes representing rural villages that are the source of agricultural activities, which were not studied in the preceding studies, will be distinguished and valuated. The direction of rural development will also be presented in the next chapter according to the value of rural villages' multifunctionality attributes.

This chapter is a preceding study for the valuation of MFA, which aims to distinguish the

MOA. In Chapter 2, it provided the previous theoretical research that took place after the UR agreement in 1994. This chapter will cover the existing studies on the valuation of the MOA and its representative index.

While valuation studies on the MOA that classify rural villages by their properties have yet to be published, valuation research on the MOA or public goods has taken place in many fields of study. The valuation studies on farming villages have mostly used the contingent valuation method (CVM) and the contingent ranking method (CRM) to quantify the non-marketed public values of the MOA, such as scenery values. These methods set up a hypothetical market and analyse customers' willingness to pay to evaluate the MOA.

Kim et al. (2006) estimated that the economic value that comes from the preservation of rural farming villages using CRM methodology is 8.4 USD monthly per household. Converting this into annual willingness to pay estimates leads to 100 USD per household, and, by multiplying it by the total number of households in the country, the total value of preserving the rural scenery is approximately 12 billion USD annually.

Ahn et al. (2005) performed CVM analysis to evaluate the worth of South Korea's public benefit from the maintenance of the traditional culture function, social community and serving the green landscape. The resulting value was an estimate of 4.7 USD per household monthly, and the total value across the households in the country was calculated as 8.3 billion USD annually.

Kwon et al. (2004) published the 'amenity value of rice farming', using the CRM to valuate paddy farming's scenery value by dividing and comparing land not in use and rice farming fields, and they found that land in use is preferred. Therefore, it was determined that agricultural production also has aspects of public benefit and provides usefulness to the public in terms of scenery. In addition, this study estimated the total value of agricultural scenery as 75 million USD annually.

Kim and Oh (2003) estimated the annual value of the MOA as the agricultural production level change in their publication on 'valuing MOA' using the same CRM method as Kwon (2004). Under the current level of agricultural production, the MOA was estimated to yield 4.3 billion USD annually, and, if the level of protection trade is increased to improve the food self-sufficiency of the country, then the annual value will increase to 6.5 billion USD. On the other

hand, reducing the country's trade protection level to what is demanded by the Specific Trade Obligations (STOs) was estimated to decrease the value of multifunctionality to approximately 2.2 billion USD.

To estimate the value of rural villages' MOA, quantified data research is required. In 1994, the OECD defined the idea of rural villages' multifunctionality of agricultural resources as not only resources that provide a pleasant environment but also both physical and intangible resources that provide economic and social values to the residents. In other words, MOA is a term that refers to all unique spaces and elements of the community in rural villages.

Oh et al. (2007) broadly classified the MOA as resources that provide a rural-style and pleasant environment, such as unique natural scenery, traditional culture and community in rural areas, and investigated the multifunctionality of agricultural resources of approximately 7400 rural villages in 70 regions of 9 provinces across Korea from 2005 to 2006. As they found high deviation depending on the region, they concluded that they needed to revise their method. Nonetheless, the study investigated the MOA of rural villages across the country and classified around 100,000 types of agricultural amenities and attributes of multifunctionality.

Ahn et al. (2005b) focused on the difference between natives and foreigners in their preference for the MOA. Ahn et al. largely divided the MOA into cultural, natural and social resources and filmed the scenery that can represent each type of resource of multifunctionality to show it to both citizens and foreigners in the survey. The study used the paired-samples T-test and showed that there was indeed a difference in preferences between citizens and foreigners with a 5% significance level. In the case of citizens, they preferred rurality and scenery resources the most, while foreigners preferred historical and cultural resources that reflect the Korean culture well.

In conclusion, various research has taken place that has subdivided the value of the MOA into pure farms, scenery and historical and cultural values. However, no studies so far have classified the representative multifunctionality of each rural village and evaluated its existence value.

This chapter is aimed at developing rural areas to cope with the trends of the times while laying the groundwork for sustainable rural development and maintaining rural diversity, so that the multifunctionality of a traditional rural village is classified by attributes, and each

attribute's economic value were estimated through two-stage survey and CE evaluation method. The value of rural villages' multifunctionality is assessed by attributes, so it is rediscovered through the value of each attribute, and the importance of agriculture is addressed.

This chapter's assessment will form the basis for the MFA analysis in the next chapter, and the study also investigates how the attribute evaluation can be affected by individual effective indicators, such as gender, rural experience, age and marital status.

2. MOA resources and attributes for the valuation

2.1 Extraction of representative attribute variables for the valuation

In 1994, the OECD defined the concept of rural multifunctional resources as residential areas that provide social and economic value to social members as tangible or intangible resources rather than simply pleasant environments, and, in 1999, it divided rural multifunctional resources into natural, scenic, historical and cultural resources according to human involvement.

In South Korea, there is a classification of the multifunctionality of rural villages, compiled by Park et al. (2002) and reconstructed by Oh et al. (2007), which defines the representative multifunctionality of an agricultural village as rural environmental attributes or emotional recognition, like rurality (agriculture, traditionality and community culture), scenic beauty (entertainment, natural affinity and visual perception) and residential convenience (accessibility, convenience, convenience and leisure activities) and largely classified rural multifunctional resources, like natural resources, cultural resources and social resources.

Table 5.1 Classification by multifunctional attributes of rural villages

Large category	Middle category	Classification multifunctionality of agricultural villages	Rural multifunctional resources
Natural resources	Environmental resources	1. Air quality (clean air)	Environmental facility resources
		2. Water quality (clear water)	Water resources
		3. Noise-free environment	Environmental facility resources
	Natural resources	4. Fertile soil	Landform resources
		5. Micro-climate (seasonal changes, cloud, fog, etc.)	Landform resources
		6. Terrain (unusual terrain, hiking trails, etc.)	Landform resources
		7. Animals (natural monuments, protected and rare animals, etc.)	Animal resources
		8. Water resources (rivers, reservoirs, groundwater, etc.)	Water resources

Continued on the next page

Table 5.1 Classification by multifunctional attributes of rural villages (Continued)

Natural re sources	Natural resources	9. Vegetation (protected trees, old and big trees, village forest, etc.)	Plant resources
		10. Wetlands or habitat (biotope)	Landform resources
Cultural re sources	Historical resources	11. Designated traditional buildings, such as cultural assets and historical sites	Traditional resources
		12. Undesignated traditional buildings (gazebos, shrines, memorial houses, etc.)	Traditional resources
		13. Religious belief space (shrines to the village deity, stone tombs, sacred trees, etc.)	Traditional resources
		14. Traditional houses (roof tiles, shingles, stone roof tiles, thatched roofs, etc.)	Traditional resources
		15. Traditional elements of villages (stone walls, mud walls, etc.)	Traditional resources
		16. Village symbol (village guide stones, sotdae (a pole signifying prayer for a good harvest), Jangseung (Korean traditional totem pole at the village entrance), etc.)	Traditional resources
		17. Famous figures (historical figures, progenitors, etc.)	Traditional resources
		18. Feng shui, legend (town originated, narrative, etc.)	Traditional resources
	Landscape resources	19. Agricultural landscape (Daraknon (a narrow, small rice paddy layered on a steep mountain valley), plain, field, orchard, etc.)	Landscape resources
		20. River landscape (reeds, rivers, stream forests, etc.)	Landscape resources
		21. Forest landscape (mountains, behind hills, etc.)	Landscape resources
		22. Residential landscape (architectural beauty, skyline, etc.)	Landscape resources
Social res ources	Facility resources	23. Community facilities (town halls, senior citizens' houses, etc.)	Facility resources
		24. Infrastructure (waterworks, sewerage, common parking, etc.)	Facility resources
		25. Public convenience facilities (sales shop, public health centres, schools, etc.)	Facility resources
		26. Environmental management facilities (wastewater purification facilities, incinerators, etc.)	Facility resources
		27. Information infrastructure (the Internet, village home page, etc.)	Facility resources
		28. Agricultural facilities (joint warehouses, storage areas, farm drainage channels, etc.)	Facility resources
	Economic activity resources	29. Urban and agricultural exchange activities (tourist farms, homestays, etc.)	Community resources
		30. Production of regional products (handicrafts, ceramics, etc.)	Regional product resources
		31. Production of special crops (special crops, organic crops, etc.)	Regional product resources
		32. Community activities (the four ceremonial occasions of coming of age, wedding, funeral and ancestral rites, social relationships, etc.)	Community resources
		33. Agricultural community activities (communal sharing of labour, sales and distribution organization, etc.)	Community resources
		34. Clan events (a visit to one's ancestral graves, ancestral rites, etc.)	Community resources
		35. Village cultural activities (performances, festivals, exhibitions, etc.)	Community resources
		36. Village recreation (traditional holiday games, production of a play, etc.)	Community resources
		37. Village management and PR activities (village maintenance, village promotion, guide activity)	Community resources

Source: Oh et al.'s (2007) reconstruction of Park et al. (2002).

Following the OECD's resource classification, Jeon (2003) classified these resources into three categories of natural ecological resources, that is, native forests and wasteland, natural and cultural landscape resources, such as village forests created by human interaction with nature, and historical and cultural resources.

Sakai (1998), chairman of the Multifunctional Meeting Room (AMR), a Japanese civic group, classified multifunctional resources as life, safety, nature, history, culture, aesthetic, convenience, individuality and comprehensive multifunctional resources, viewing rural multifunctionality as a very spatially comprehensive concept (Kim and Oh, 2003). Kim (2004) compiled the existing research cases (Cho et al., 2002) to evaluate the local rural multifunctional areas and classified them into the form of resources added to the entity by history, landscape, economic activities, social activities and exchange activities.

Table 5.2 General classification of multifunctional attributes of rural villages

OECD (1999)	Jeon (2003)	Kim et al. (2004)	Sakai (1998)	Oh et al. (2007)		**Represent multifunctionality attributes**
Nature	Natural ecology	History	Life safety	Nature		**Nature and environment**
Agricultural landscape	Natural and cultural landscape	Landscape	Nature	Culture	⇨	**Landscape**
History and culture	History and culture	Economic activity	History and culture	Social		**History and culture**
		Social activity	Aesthetic			**Social/public activity**
		Public activity	Convenient			
			Comprehensive			

The analysis of the multifunctional properties according to each researcher shows that the natural, environmental, historical and cultural resources are commonly the same and are classified as social resources or community activity resources and landscape resources. In the case of landscape resources, the OECD, Sakai (1998), Jeon (2003) and Kim et al. (2004) classified them as representative resources, while Oh et al. (2007) classified them into a middle category of cultural resources. Oh et al. (2007) interpreted and classified the OECD's (1999) primeval natural resources, resources generated by human interaction with nature and man-made artificial resources into natural resources, cultural resources and social resources, respectively (Table 5.1). The three multifunctional resources were then classified, and detailed

resources for regularization were analysed after expert discussions, which differed from the approaches of other researchers. Therefore, this chapter classified natural (environmental) resources, landscape resources, historical and cultural resources and social (community) resources, as shown in Table 5.2, and extracted them as representative resources of rural multifunctionality.

2.2 Affective facts about the extracted attributes

Table 5.3 shows that natural and environmental resources can be distinguished into primeval natural resources, such as topography, wetlands, village forests and natural monuments, and environmental resources, such as the degree of air quality, water quality, noise and biodiversity. Historical and cultural resources are man-made resources and have been created in the past, such as cultural assets, historical sites, stone roofs, architectural styles, village legends and *feng shui*[11], which have been handed down from generation to generation.

Unlike other resources, rural landscape resources are very comprehensive and difficult to standardize as they can affect trading activities simply by individuals giving them value. Landscape resources can be said to be optical resources, perceived as a total unit of the image, which is a physical form of the entire village, such as the landscape of the village, grasslands and the landscape of paddy and field crops as well as the form of houses (Ahn et al., 2005).

Lastly, as a social activity, the community activity resources of rural villages are historical and cultural-based activities, such as community activities, clan events and seasonal customs, which can be said to be social resources for the existence and maintenance of the village.

Table 5.3 Four extracted representative multifunctional attributes of rural villages

Attributes	Evaluation method
Nature and environment	Degree of nature and environmental damage (ecosystem, fresh air, water quality, soil)
History and culture	Degree of cultural and historical damage (cultural properties, indigenous beliefs, traditional houses, walls)
Landscape	Degree of landscape destruction
Public activity	Degree of disappearance of community activities (ceremonies, *pumasi*[12], clan events, holiday play, etc.)

[11] An ancient Chinses or Korean belief that the way their house in built or the way that arrange objects affects their success, health, and happiness

[12] It is an act of lending Korean labour, and it is a joint production activity.

3. Survey design

The survey consisted of two stages. The first stage was a pre-survey and was a previous step to investigate the value assessment of the multifunctional attributes of rural villages. In the first phase, seven agricultural and environmental experts, including myself, were surveyed about the payment for conserving four representative multifunctionalities of agricultural villages. The selected group of experts was made up of academic and professional researchers in the fields of environmental economy, agricultural policy, landscape, rural development, regional economy and rural tourism.

3.1 Survey step 1

The valuation of environmental goods without physical transactions may be made according to the amount of payments presented by the researcher. Therefore, a prior study on the MOA and public functions of rural areas was conducted, and the value of the rural public functions and multifunctionality estimated in the preceding study was presented as a reference. The form of the questionnaire summarized the research carried out in this chapter and specifically suggested the monthly payment amount for the preservation of multifunctional attributes in rural villages. However, it added that the payment would be made only once. As a result, the average payment reported by experts for rural conservation was found to be USD 7.5 per month per household. This amount was the reference for the second questionnaire conducted with the public and was presented as the median value for each level of the five-unit amount attribute.

Table 5.4 Step 1: Expert survey on WTP

Specialist	Field	WTP (USD)	Organization
○○○	Agricultural economics	3	SNU
○○○	Agricultural policy	3	SNU
○○○	Landscape, GIS	15	SNU
○○○	Regional economics	5	SNU
○○○	Environmental economics	8	SNU
○○○	Tourism	15	KREI
○○○	Tourism	7	KEI
Researcher	Agricultural economics	4	CNI

Note: SNU, Seoul National University; KREI, Korea Rural Economic Institute;
KEI, Korea Environmental Institute; CNI, Chungnam Institute.

3.2 Design of the questionnaire selection combination

To separate the cost of improvement for the degree of damage to the multifunctional attribute variables in rural villages, orthogonal main effect design methods were used to ensure orthogonality among individual attributes through the CE method. An orthogonal design is a statistical method in which estimates of one parameter can be constructed in a selection combination while maintaining independence without being disturbed by other factors and can improve the problem of high correlation, such as that in the present preference probability model (Hanley, 1998). As shown in Table 5.5, there are five attributes in this chapter, each with three attribute levels and five improvement cost attributes. If the attribute level of the improvement costs is USD 0, the entity may be excluded from the selection combination because people are unwilling to pay, as shown in the questionnaire in Table 5.6.

Table 5.5 List of attribute levels

Attributes	Degree of conservation	
Degree of nature and environmental damage (ecosystem, fresh air, water quality, soil)	A 0% B 25% C 50%	0% is well preserved
Degree of cultural and historical damage (cultural property, indigenous beliefs, traditional houses, walls)	A 0% B 25% C 50%	
Degree of landscape destruction	A 0% B 25% C 50%	
Degree of disappearance of public activity (ceremonies, pumasi (custom of helping each other), clan events, holiday play, etc.)	A 0% B 25% C 50%	
Improvement cost for conservation (USD) (only once)	3 7.5 11 14	

The total number of selection combinations per attribute in Table 5.5 is 3 × 3 × 3 × 3 × 4. However, questioning respondents about all the possible combinations is very difficult in reality, so the minimum number of combinations that can represent the whole should be extracted and analysed. A total of 60 combinations were extracted using the OPTEX[13] command of the SAS program to extract the smallest combination that could represent all combinations,

[13] It was set to a value more than 99% of the D-efficiency value.

Table 5.6 Examples of CE modelling questions

1)	①	②	③
Degree of nature and environmental damage (ecosystem, fresh air, water quality, soil)	C*	B	I do not wish to pay for this situation
Degree of cultural and historical damage (cultural properties, indigenous beliefs, traditional houses, walls)	B	C	
Degree of landscape destruction	C	C	
Degree of disappearance of public activities (ceremonies, pumasi, clan events, holiday play, etc.)	C	C	
Improvement cost for conservation (only once)	USD 3	USD 7.5	
	☐	☐	☐

Note: * 'A' equals a case of 0% damage, which means well preserved, B equals 25% damage and C equals 50% damage.

and these combinations were used as two alternatives, excluding the third of the three alternatives in the questionnaire combination, 'I do not wish to pay for this situation'. The actual questions used in the questionnaire are shown in Table 5.6, with a total of 10 questions presented, two for each choice.

3.3 Survey step 2 (main survey)

The two-step questionnaire was chosen to increase the response rate in the survey, to ask detailed questions and to provide the respondents with the best opportunity to respond, as the mailing or telephone questionnaire of the first-stage survey method was limited to gaining an accurate understanding of the various attributes and price interrelationships among the respondents. The survey targeted adults aged between 19 and 62 living in the country. The nationwide survey was conducted by classifying the country into six zones using the stratified sampling method.

Table 5.7 Stratified sampling

Area	General population ratio (%)	Planned sample size	Determined sample size (%)
Seoul	21	31	32 (25.6)
Gyeonggi	26	39	32 (25.6)
Gangwon	3	6	4 (3.2)
Chungcheong	9	14	11 (8.8)
Gyeongsang	20	30	27 (21.6)
Jeolla	13	20	19 (15.2)
Total	100	140	125 (100)

A total of 140 samples were allocated to each region because the step 2 survey used stratified extraction techniques that considered locality. Table 5.7 shows the planned and surveyed sample numbers that were set to match the ratio and proportion of households in each city and province.

It was difficult to move around the country to conduct the survey using stratification extraction techniques. In addition, the survey sought ways to reduce excessive consumption of time and money by adopting personal interviews without the use of postal and telephone questionnaires. As an alternative, a survey was proposed to be undertaken at Seoul Station, Honam Express bus terminal in Banpo-dong, Seoul, and Gyeongbu Express bus terminal, where people from all over the country gather and the survey could be conducted using stratification techniques.

The survey was conducted by six selected graduate students in 2008. The surveyors were trained in advance to understand how to conduct surveys and interviews and to prevent their personal opinions from being collected during the survey process. This survey was conducted by adopting a stratification extraction technique based on the ratio of households by region, which required regional arrangements, and involved first conducting the survey randomly and then adding samples in the case of insufficiency. A total of 125 samples were examined. A small number of samples may cause some limitations in making accurate value estimates, and, although the number of samples planned for each region was not accurately investigated, it is considered meaningful if the regional samples are all close to the proportion allocated to the planned number of samples and the estimates can produce significant results.

3.4 Analysis model

Using the choice experiment method, attributes can be valued through the conditional logit model. The satisfaction of individual *n* selecting choice *j* is the same as the function number (5.1).

$$U_{nj} = \beta_{\mathrm{t}}\chi_{\mathrm{t}} + \beta_{\mathrm{e}}\chi_{\mathrm{e}nj} + \beta_h\chi_{hnj} + \beta_l\chi_{lnj} + \beta_p\chi_{pnj} + \beta_s(\chi_{\mathrm{t}}\chi_{snj}) + \beta_m(\chi_{\mathrm{t}}\chi_{mnj})$$
$$+\beta_r(\chi_{\mathrm{t}}\chi_{rnj}) + \beta_i(\chi_{\mathrm{t}}\chi_{inj}) + \beta_x(\chi_{\mathrm{t}}\chi_{xnj}) + \varepsilon_{nj} \quad (5.1)$$

where: χ_t is the improvement cost for resource conservation;
$\chi_{e\sim}\chi_p$ are multifunctional attributes of rural villages;
$\chi_{s,\sim}\chi_x$ are dummy variables.

In this chapter, each response can be assumed to be independent of 10 combinations. There may be dependencies because one person chooses them, but each combination is selected randomly, so the dependency problem will not be significant. In addition, the nature of the independence of irrelevant alternatives (IIA) will not affect the tendency to select 3 in the ratio of selections of each combination, assuming the logit model already, and the utility function will not be too much to make the overall assumption of independence determined by questionnaires 1 and 2 (Kwon, 2005).

If we consider how much people intend to pay as the attributes of the rural village multifunctional change and set the indirect utility of the multifunctional attributes for each property damaged before the change to V_{nj}^0, then the indirect utility after the change of the property is V_{nj}^1, and the resulting compensation variation (CV) is derived as the following equation (5.2):

$$CV = -\frac{1}{\mu}[\ln \sum_{j=1}^{J} \exp(v_j^0) - \ln \sum_{n=1}^{J} \exp(v_j^1)] \quad (5.2)$$

Marginal utility of income μ or marginal cost of price -μ

The amount that people want to pay when the multifunctional attributes are improved by one unit overall can be determined using equation (5.2). The amount payable can be derived simply as in formula (5.3) (Haab and McConnell, 2002); if the multifunctional attributes of each rural village are preserved by one unit per attribute, it is possible to determine people's WTP for a unit change (Δq).

$$WTP = -\frac{\Delta q \beta}{\beta_t} \tag{5.3}$$

where: Δq overall change in attribute;

β parameter of attribute;

β_t marginal utility of income or payment.

4. Survey and estimation results

4.1 Some statistics about the survey respondents

1) Purpose of visiting rural villages

Figure 5.1 shows the respondents' primary purpose of visiting rural villages as a percentage. Of the visitors, 58% are visiting family rather than carrying out tourism, nature appreciation, and cultural resources or learning activities. When visiting rural villages, they will engage in additional activities, such as appreciating nature and purchasing agricultural products, Half of Koreans visit rural areas for the purpose of simply visiting relatives and not for special purposes. In this situation, their awareness of rural tourism is still in its early stages.

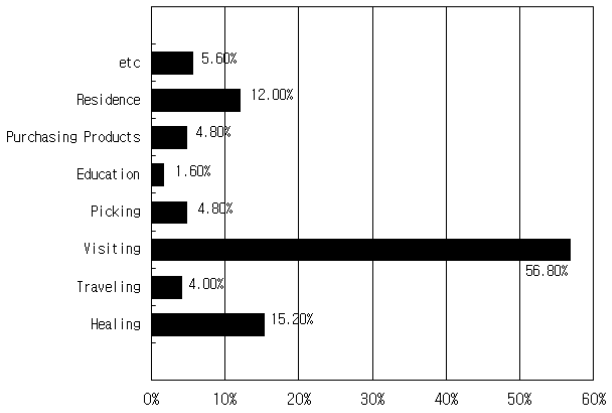

Figure 5.1 Purpose of visiting rural villages

2) Awareness of the importance of multifunctional attributes

Before being presented with the questionnaires, the respondents were asked whether they knew what the phrase ‘rural multifunctional’ meant, the majority stating that they were not aware of this term. The surveyor gave a detailed description of the meaning of rural multifunctional and asked the respondents to choose the most important among the four multifunctional attributes, as shown in Figure 5.2. The purpose of this was to enable them to recognize the importance of the multifunctional attributes and to provide a confident opinion before choosing a selection combination. The intention was also to investigate the importance of rural village resources, which differ in people’s valuations. As a result, 45% of the respondents chose natural environment resources, followed by 31% indicating historical and cultural resources. This result will be compared with the attribute-specific values later.

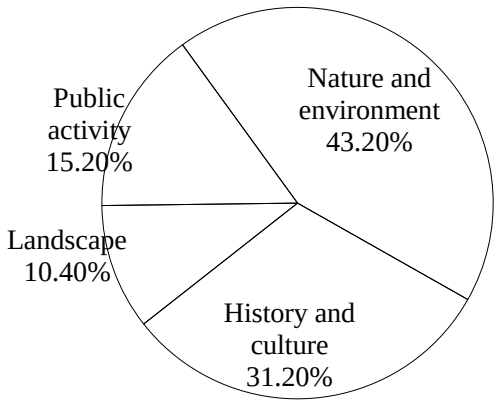

Figure 5.2 Prior test for attributes

3) Educational background and household income

The highest level of the educational background was shown to be college graduation, with 52.7%, followed by high school graduation, graduate degree or higher, middle school graduation and elementary school graduation. According to the 2015 statistics of the Ministry of Education, Science and Technology, 38% of Koreans graduate from high school, and 50% graduate from university. In this chapter, the ratio of high school graduation found is 38 and

college graduation found is 53%, showing considerable consistency.

Table 5.8 Income and education level (n = 125)

Characteristic		Results
Education	Under middle school	2%
	High school graduate	38%
	College	53%
	Postgraduate	7%
Household income	≤$10,000	4%
	$10,001–$20,000	24%
	$20,001–$35,000	37.6%
	$35,001–$50,000	20.4%
	$50,001≤	13.6%
	Avg.	USD 3,180

The monthly average household income ratio was investigated and is presented in Table 5.8. The survey was conducted with a deviation of USD 5,000 per total of five units. The actual wage income excluding monthly taxes was chosen, and, in the case of students or jobless people who live separately from their family, the family income was used. As a result, 37.6% of households earn between USD 2,001 and USD 3,500 per month, with an overall average income of USD 3,180.

4) Regional sample propensity

A total of 132 samples were investigated. Seven of these samples were excluded for reasons such as insincerity and missing variables, so the total number of samples used in the survey was 125. The samples were identified by region and gender ratio, as shown in Table 5.9. The marital status was found to be 54 married and 71 unmarried.

If the respondents have lived in rural areas, they are likely to value rural villages multifunctionally more highly. Therefore, the survey asked the respondents whether they had lived for 1 year or more in rural areas: 64 samples of the total had lived in rural areas, and 61 had not.

Table 5.9 List of regional gender ratios and living experience in rural villages
Unit: samples

	Seoul	Gyeonggi	Gangwon	Chungcheong	Gyeongsang	Jeolla	Total
Male	18	22	2	7	18	13	80
Female	14	10	2	4	9	6	45
Agri tour: Experience	17	15	3	6	11	12	64
Agri tour: No experience	15	17	1	5	16	7	61
Married	13	11	2	3	15	10	54
Single	19	21	2	8	12	9	71
Rural living: experienced	17	15	3	6	11	12	64
Rural living: inexperienced	15	17	1	5	16	7	61

4.2 Estimation result of the multifunctionality of rural villages

4.2.1 Estimated results using conditional logit model

Table 5.10 contains the estimated results of equation (5.1). The estimated coefficient of rural village multifunctional attributes was analysed with conditional logit and estimated to be statistically significant at a significance level below 10% for the four characteristics representing rural villages and gender.

As expected, all the estimated coefficients of the multifunctional attributes were positive (+), indicating that the more damaged the multifunctional attribute was, the more eager people were to participate in the recovery. The improvement costs indicated negative signs and, contrary to other multifunctional attributes, showed that people's willingness to participate decreased as the costs increased. The results of using the individual characteristics that could affect the attributes as dummy variables and estimating the coefficients showed that there was an alternation in cost. While the gender dummy and experience in rural villages had statistically significant results at a significance level of less than 10%, income per household and marital status did not. These results in individual characteristics can be interpreted as meaning that individual inclinations except for gender and rural experience have a limited effect on the MOA and in terms of gender, it is presumed that women actually have a negative reaction to new

spending because of concerns about household expenses. In the case of rural living experience, the initial expectation was that those who had lived in rural areas were expected to have a higher willingness to pay, but contrary to the expectation, it was estimated that those without experience in rural areas had higher willingness to pay. Although more detailed research is needed, it can interpret that those who have not lived in rural areas have higher incomes or are more aware of the rural environment and MOA.

Table 5.10 Results and coefficients of the attributes of rural villages

Variables	Conditional logit	
Nature and environment	0.0339754***	
History and culture	0.0290640***	
Landscape	0.0109623***	
Public activity	0.0136617***	
(Dummy × cost) Male = 1; female = 0	0.0000653***	Individual characteristics
(Dummy × cost) Married = 1; otherwise = 0	0.00000983	
Income × cost	0.0000000163	
(Dummy × cost) Experience rural place = 1; otherwise = 0	-0.0000309**	
Cost (WTP)	-0.0000601***	

Note: *** is ρ-value parameter below 1%, ** is below 10%,
Log likelihood = -959.8015, LR Chi2(9) =826.9, Pseudo R^2 =0.3011

Using the WTP estimation methods of Habb and McConnell (2002) to estimate the value of each attribute adopting interaction terms using equation (5.3), the marginal willingness to pay (MWTP) for each attribute can be derived and this equation could be adopted interaction terms. Under the assumption of the linear utility function without interaction terms ($U_j = \beta_q\, q_j + \beta_t\, t_j + \varepsilon_j$), the marginal WTP is $-\beta_q\,/\beta_t$ where β_q is the marginal utility of attribute q_j of alternative j, β_t is the marginal utility of cost t_j and ε_j is the error term. However, when the utility function has interaction terms between the cost and individual attributes s ($U_j = \beta_q\, q_j + \beta_t\, t_j + \beta_{st}\mathrm{s}\cdot t_j + \varepsilon_j$), as this paper, the WTP is the solution to $\beta_q\, q_j + (\beta_t + \beta_{st}\mathrm{s}) \times WTP_j + \varepsilon_j = \beta_0 + \varepsilon_0$. Thus, the marginal WTP is $(\beta_t + \beta_{st}\mathrm{s})$ as in Table 5.11.

Table 5.11 Derivation of MWTP considering interaction terms

	Variables	Method
$MWTP$	Nature and environment	$-\beta_e/(\beta_t + \beta_{st}\mathrm{s})$
	History and culture	$-\beta_h/(\beta_t + \beta_{st}\mathrm{s})$
	Landscape	$-\beta_l/(\beta_t + \beta_{st}\mathrm{s})$
	Public activity	$-\beta_p/(\beta_t + \beta_{st}\mathrm{s})$

The value of further improving the individual attribute levels of rural village multifunctional attributes by one unit was shown to be high, in the order of nature and environment resources, history and culture resources, public activity resources and landscape resources. The value of nature and environment resources was found to have the highest WTP of USD 1.32 per person to recover one unit from the current state of rural multifunctional attributes in Table 5.12.

Table 5.12 Value of multifunctional attributes of rural villages

Attributes		Value (USD)
Nature and environment	C → B or B → A 1 step (unit) (25%) improvement or recovery	1.32
History and culture		1.11
Landscape		0.42
Public activity		0.53

Prior to the value evaluation, the importance of the four MOA through a survey was conducted as a frequency analysis as shown in Figure 5.2. According to the results, the ratio of natural environment resources as the most important resource was the highest at 43.2% of the total. It was followed by historical and cultural resources at 31.2%, community resources at 15.2%, and landscape resources at 10.4%. In the result of CE analysis in Table 5.12, the ranking was the same as in Figure 5.2, and the value of per unit in a damaged to 25% restoration was estimated USD 1.32 for nature and environment, USD 1.11 for history and culture, USD 0.53 for public activity and USD 0.42 for landscape resources. Therefore, the existence value of MOA has been proven, and its applicability will be analysed next chapter.

4.2.2 Latent class model and Heterogeneity problems

Meanwhile, the estimation in the above section has a problem not considering heterogeneity in preferences of environmental attributes. Recent CE studies on MFA found heterogeneous preferences. For example, Dominguez-Torreiro and Solino (2011) analyzed CE data on multifunctional rural development policies using random parameter logit (mixed logit) to account for unobserved taste heterogeneity. Sangkapitux et al. (2017) found heterogeneity in preferences of MFA using latent class logit model. Therefore, it is necessary to apply a model that considers validation and heterogeneity to the results of this study. In this chapter, the latent class conditional logit (LCL) model that can be applied to the conditional logit model is applied to examine whether there is heterogeneity in the model, and to separate or remove the heterogeneous latent class to verify the model.

The LCL model extends the conditional logit model by incorporating a discrete representation of unobserved preference heterogeneity. Algebraically, the LCL likelihood function is a finite mixture of classes different conditional logit likelihood function (Yoo, 2020).

LCL extends the conditional logit by incorporating discrete representations of unobserved preference heterogeneity among decision makers. LCL also assumes that there are distinct types or classes of decision makers, and that each class makes choices consistent with its own clogit model using a utility coefficient vector $\beta\ c$. Assume that the probability that a decision maker n belongs to class *c* is given by a fractional multinomial logit specification (Yoo, 2019).

$$\pi_{nc}(\gamma) = \frac{\exp(z_n\theta_c)}{1+\sum_{l=1}^{C-1}\exp(z_n\theta_l)} \tag{5.4}$$

By Yoo's multinomial logit specification (5.4) where z_n is a row vector of decision maker n's characteristics and the usual constant regressor (i.e. 1); θ_c is a conformable column vector of membership model coefficients for class c, with θ_c normalized to 0 for identification; and $\gamma = (\theta_1, \theta_2, \ldots, \theta_{C-1})$ denotes a collection of the C -1 identified membership coefficient vectors. Under LCL, the joint likelihood of decision maker n's choices is given by

$$L_n\left(B,\gamma\right)=\sum_{c=1}^{C}\pi_{nc}(\gamma)P_n(\beta_{c)} \quad (5.5)$$

where $B=(\beta_{1,}\,\beta_{2,\ldots,}\,\beta_C)$ denote a collection of the C utility coefficient vectors, and each $P_n(\beta_c)$ is obtained by evaluating general conditional logit model.

It is necessary to determine whether there is heterogeneity in the conditional logit result in Table 5.10, and LCL analysis was performed to find out how many potential classes are on it. Table 5.13 shows the estimated coefficient of each variable for each latent class. As a result of the analysis, it was found that there are two latent classes and there is heterogeneity. An appropriate number of potential classes can be determined according to the result of the Bayesian information criterion (BIC). In two cases, the BIC result is 1935.2, whereas in the case of three, the BIC result increases to 1957.9. The smaller the value, the more appropriate the class.

Among the two classes, Class 1 occupies 71.9% of the total sample, and Class 2 shows that the hierarchy can be separated by 28.1%, and there is heterogeneity in nature and environment, history and culture, and public activity variables.

According to the LCL estimation result, the value of MOA can estimate the optimal value of the two latent classes. Through maximizing loglikelihood using EM algorithm, Class 1, Class 2, and Share 1 correspond to $(\beta_{1,}\,\beta_{2,\ldots,}\,\beta_C)$ and θ_1 respectively for equations (5.4) and (5.5) above. Table 5.14 is obtained as a result of estimating the five random coefficients variables involving heterogeneity presented below in Table 5.13 and cost variables.

Table 5.13 Estimation result of LCL

Variables	2 classes		3 classes		
	Class1	Class2	Class1	Class2	Class3
Nature and environment	0.084	-0.098	0.163	-0.036	0.077
History and culture	0.019	0.167	0.047	0.078	-0.002
Landscape	0.031	0.021	-0.014	0.005	0.101
Public activity	0.048	-0.047	0.028	-0.018	0.098
Cost	-0.000	0.001	-0.000	0.000	-0.001
Class Share	0.719	0.281	-0.371	0.295	0.334
Result of BIC	1935.2		1957.9		
Log likelihood	-928.4		-928.3		

As a result of LCL estimation, in Class 2, the values of nature and environment, history and culture For MOA variables were significant, but the values of other variables were not significant. In addition, the coefficient value of the nature and environment variable obtained a significant probability value, but it was estimated as a negative sign even it should be positive, and it seems that the results caused by the respondent or judgment error were included in Class 2.

Table 5.14 The estimation value of LCL MLE

Variables (ML)		Class1	Class2	Value of class 1 (USD)
Nature and environment		0.083509***	-0.09932***	0.310
History and culture		0.019036***	0.168824***	0.070
Landscape		0.03054***	0.021218	0.113
Public activity		0.04839***	-0.04729	0.179
Cost		-0.00027***	0.000526***	
Class Share		0.719	0.281	
Share1	Constant	0.941507***		
Log likelihood		-928.4		

Note: *** is ρ-value parameter below 1%.

On the other hand, the result of Class 1 occupies 71.9% of the total sample, and significant values were estimated for the four attributes of MOA and also the cost variable for which the value was to be estimated in this chapter.

As a result of estimation by the LCL model in Table 5.14, it showed the largest change in the value size. It was about 25% of the value estimated by the conditional logit model. The value of natural environment resources was estimated to be the highest at USD 0.310, followed by public activity at USD 0.179, landscape at USD 0.113 and history and cultural resources at USD 0.07 at the lowest estimate. In the ranking change of value, the value of history and culture resources ranked second in the conditional logit model in Table 5.10, but LCL showed the lowest value. It means that the selection of respondent for the history and culture of the Class1 and Class2 layers are very different and has heterogeneity.

As a result, it can be seen that the conditional logit model has heterogeneity in the existence value of MOA, but in fact, people evaluate it as a lower value than the researcher's expectation.

In order to further clarify the existence value of MOA, it is necessary to construct a clear questionnaire to reduce heterogeneity and to secure a larger number of samples to analyse meaningful LCL results between classes.

6. Conclusion

With the increasing interest in rural multifunctionality, which is considered to be a new alternative to rural development, research related to rural multifunctionality is increasing continually and previous researches have been limited to the simple evaluation of Korea's MOA, the classification of externalities or amenity resources, and the value evaluation of agricultural production activities. It is meaningful in that it extracts MOA and evaluates the existence value in the spatial concept. For the valuation, the entire country was classified into six regions, and 125 samples were collected by applying the ratio of households to the country.

The analysis model used to support the above theory to estimate the attribute value of rural multifunctional attributes was conditional logit analysis, and the estimates showed very statistically significant results. The value of a single unit of restoring damaged rural village multifunctional attributes per a household was estimated to be high, in the order of nature and environment resources (USD 1.32), history and culture resources (USD 1.11), public activity resources (USD 0.53) and landscape resources (USD 0.42). Given that the estimated coefficients were all positive (+), it was estimated that the greater the damage to the rural village's multifunctional attributes, the greater the desire to restore them and the more willing people would be to participate. This chapter also found that the problem of heterogeneity according to the conditional logit analysis has recently emerged, so the LCL model was applied to the conditional logit analysis result. In fact, the result value by conditional logit was divided into two classes, and it was found that there was heterogeneity in these four attributes of MOA variables. The order of values was almost coincidence, but the history and culture resource values were estimated to be the fourth as high even it was the second highest in conditional logit method. In these results, it can be said that the value of the result after removing heterogeneity is a more accurate value, but it is unreasonable to judge that which value is accurate because the result of the respondent who presented a negative or different opinion such as class 2 is separated. However, in this chapter, the purpose of analysing the existence value of MOA to

utilize its functions is meaningful, and it is meaningful that it is clear that there is an existence value as a result of two value analyses.

The classification and estimation of rural village MOA were carried out to recognize the importance of agriculture, that is, the source of livelihood for rural villages and sustainable rural development. The reasons are the following: 1) the value of ruralness in each field of rural villages should be re-recognized; 2) environmental goods that perform multifunctionality, such as public goods (referring to NTCs), will produce market failure; 3) agricultural production should be recognized as a crucial resource in the present era of food security, and rural multifunctionality does not exist without agriculture; and, lastly, 4) MOA is just an environmental resource in itself. Thus, it serves as the basis for a vital resource cycle that provides clean air and water, which are resources that should be fully compensated, and the potential for utilization in accordance with social changes is infinite.

Chapter 6 A Valuation Analysis of MFA strategies

1. Introduction

Conventionally, agriculture is composed of a productive aspect, which includes agricultural products such as milk or potatoes (classical agriculture), and a regional aspect, whereby resources that follow production activities are compounded as a region (rural area) (Meeus et al., 1998), as well as the mobilization and utilization of the regional resources, such as animal, vegetation, capital, water, equipment and education systems, that take part in production. The three aspects of agriculture are not dependent upon one another and have an apparent inter-cooperative relationship (van der Ploeg and Roep, 2003). MFA ranges from primary food production to environmental and social multifunctions, which have not previously been taken into consideration in the agricultural industry, such as biodiversity recovery, environmental decontamination, multifunctional restoration, the utilization of cultural resources and food security (Belletti, 2002).

The existence value of the MOA was revealed in Chapter 5. Therefore, it is now possible to analyse a form of MFA programme that utilizes multifunctionality by using the stated preference method. The main purpose of this analysis is to evaluate the important decision to measure the appropriate use of MOA and sustainable agriculture.

Most research on the existence value of environmental goods and their social value in rural areas has concentrated on assessing the value of a specific field rather than the multilateral functions of agriculture. Yrjola and Kola (2004) classified the multilateral functions of agriculture into food security, animal welfare, rural viability, food safety, environment and landscape and then estimated their values using the contingent valuation method (CVM). On the topic of valuing methods for non-common goods, Kwon and Yun (2004) and Kwon et al. (2007) estimated paddy agriculture's landscape value using the contingent ranking method (CRM) and the value of water resources using a choice experiment (CE), providing representative examples for South Korea. Furthermore, Novikova et al. (2019) assessed the landscape value of agriculture as a whole, resulting in the contingent method indicating the need for more expenditure on the rural landscape at the common agricultural policy level (CAP) and

the national level in the EU. The research about MFA includes the studies by van der Ploeg and Roep (2003) and Menghini et al. (2014), which used the Farm Accountancy Data Network (FADN) to classify strategic attributes and assess their weight in the entire agricultural industry and their impact on the National Values Assessment, and those by Finocchio and Esposti (2008) and Schimmenti (2016), which analysed the elements that had an impact on rural development and MFA under the EU CAP.

The research conducted by Finocchio and Esposti (2008) adopted a revealed preference analysis, using FADN data, concerning the degree of multifunctionality, area, age of the farmer and agricultural machinery ownership but not multi-agricultural strategic attributes. In summary, valuations of environmental goods, such as the natural environment of agriculture, have applied the CVM, CRM and CE techniques, and MFA analyses have investigated regional characteristics by country and suggested strategic directions. MFA and agriculture are more comprehensive value chains, which need to be analysed comprehensively and the direction of development determined based on the results. As well as different environmental benefits, the outdoor recreation values of water resources can be estimated using the revealed preference model and stated preference model (Freeman, 2003; Young, 2005; Kwon et al., 2007).

This chapter initially attempts to assess the impacts of the social benefits generated by farmhouse visits on the development of comprehensive agriculture, such as the sixth industrialization movement or MFA. It estimates the social and existence values of MFA and observes the relationship that citizens (the subjects of the experiment) experience with agricultural production dependence.

Further, MFA was structuralized for the first time by van der Ploeg and Roep (2003). It has been described as an agricultural technique based on resource recycling; reducing dependence on external resources through regrounding, such as environmental or extensive agriculture; direct trading, which allows production activities to extend beyond their conventional value; the deepening of elements, including processing; and broadening, which utilizes nature or the landscape to achieve external impacts from activities such as field visits, social farms and care farming. Finally, this chapter attempts to analyse the feasibility of the successful adaptation of the horizontal development of these techniques in South Korea, as implemented in Europe. It is expected that, by estimating the benefits of each attribute, it will be possible to establish criteria

for MFA development in South Korea.

In terms of the estimation of multifunctional farm status, the value of existence and social values, applying the quantified variables in an analysis model is difficult since it is hard to find a place that represents multifunctional farm statuses based on region, village, geography and population structure, and it is hard to claim that the place represents all MFA. Furthermore, because it is even more unlikely that a place can be found that fulfils the requirement for many sub-attributes of all three strategic types of MFA, a virtual multifunctional agricultural area (rural village) is constructed in this chapter. With the assumption that vacations take place within the area, it may be appropriate to analyse the impact of the change of benefits on the recreational condition and natural environmental change, and, for such an estimation of value change from condition changes, the selected experiment method (state-selective multi-reference coupled-cluster theory) developed by Adamowicz et al. (1994) can be used (Kwon et al., 2007).

For such reasons, this research estimates the benefits for each detailed attribute using a choice experiment method, the stated preference model. The stated preference model assumes that people will respond to a hypothetical market situation as if they were in the actual market (Shin et al., 1997) and creates a series of combinations of selectable attributes, including environmental attributes, allowing the subjects to choose a preferred combination, like the choice experiment method. The selected combination is then differentiated from non-selected ones. Subsequently, a conditional logit model can be applied to estimate the values of each attribute using the result of utility function estimation, indicating a satisfaction rate that depends on the environmental and recreational value preferences suggested in the selection.

2. Experimental design approach

The agricultural production dependence [14] condition was added to the three strategic components suggested by van der Ploeg and Roep (2003) – deepening, broadening and regrounding – to observe its relationship with the three strategies and agricultural production. An interview was conducted with a village leader to identify the attributes and levels of the resources existing around a rural village in detail, and a provisionally designed survey based on

[14] It is hypothesized that regions with high agricultural production activity will possess high positive MOA.

a virtual, multifunctional farm was developed with many attributes for the respondents to select, with reference to Aguglia et al. (2009) and Menghini et al. (2014), and such detailed attributes are indicated in Table 6.1.

Deepening, the first strategy of MFA, has four components: general agricultural product direct sales, environmentally friendly farm product sales, the management of restaurants and the construction material types of the facility. Agricultural products were classified as environmentally friendly or ordinary products and were then categorized as eco-friendly or ordinary products. Restaurants in which locally grown products are used were considered due to a possible preference for such factors. In the case of building materials, the reality of Korea was reflected. In order to understand the importance of materials in terms of sustainability, farmhouses having difficulty in investing in construction costs are using one-time facilities, green houses, and steel structures.

Broadening the scope, the second strategy suggested rural service activities, such as field trips, accommodation and experience activities, including participation in nature breaks, involvement in traditional cropping practices, such as planting, weeding, irrigation and harvesting, rural ecological experiences and traditional front-yard cleaning with bamboo broomsticks. Broadening activities include handicrafts, such as making bamboo brooms, colanders and straw shoes and cooking experiences, field trips to rural areas and, finally, accommodation in rural areas, which includes stays on farms or in traditional Korean houses.

Finally, concerning the regrounding strategy, van der Ploeg and Roep (2003) defined their triangular multifunctional agricultural policy as optimized input-induced rural development. It can be assumed that, of the three strategies, regrounding must be primary. Regrounding also relates to the quality of essential agricultural resources. The respondents' perception of rural areas, concerning their cleanliness, environmentally friendly nature, natural landscape, water and the activity of natural services, may considerably affect the level of benefits generated. Therefore, as attributes that represent regrounding, the sustainability of agriculture is defined as the degree to which its dependence on external inputs can be minimized and the use of internal resources can be maximized to conserve the rural culture. Examples include resource recycling, multi-variety small-scale production and high-input, single-variety large-scale production, respectively.

Table 6.1 Eleven detailed attributes of MFA

MFA strategy	Attribute	Description
Agricultural production dependence	Income level of agricultural production dependence	20%/55%/85%
Deepening (DPN)	Conventional direct market	◯, X[3)]
	Organic direct market	◯, X
	Restaurant	◯, X
	Material type of facility[1)]	Shelter/wooden/brick/steel
Broadening (BDN)	Experience activity programmes	Nature breaks/ecosystem/harvesting/cooking/ handicrafts/field trips
	Accommodation type	Hotels/Hanoks[2)]/campsites/farm stays
Regrounding (RGN)	Eco-friendly agricultural area	◯, X
	Landscape	Good/normal/bad
	Biodiversity (encounters)	(3/18/33 sp./1 hour)
	Multi-diversity of agriculture: circulation of agricultural resources	Resource recycling, multi-variety small-scale production vs. high-input, single-variety large-scale production
	Dependence on renewable energy usage	0%/45%/90%
Distance	Distance from residents	70 km/120 km/170 km/220 km

Note: 1) Sustainability and eco-friendliness of the facility regarding construction materials;
2) Korean traditional house; 3) if yes = ◯, if no = X;

A set of attributes affecting the choice of MFA sites was developed to design the CE for the stated preference model and reflect the actual or virtual characteristics of the resources in the MFA. Table 6.1 presents the set of attributes and levels spanned by the CE set. Given that each attribute was not controlled to be discrete, there are 25 × 34 × 42 × 52 possible alternatives. Therefore, this variation needed to be treated in as few alternative sets as possible. For violations of the independence of irrelevant alternatives (IIA) attribute of the conditional logit model, ensuring IIA of the testing requires at least three alternatives, which were satisfied in this case by including the stay-at-home option, as discussed by Louviere and Woodworth (1993) and Adamowicz et al. (1994).

The orthogonal main effect design used SAS OPTEX[15], which can secure orthogonality between the attribute variables of the experimental design (Adamowicz et al., 1994). Among the selection groups, selection alternatives with an absolute advantage or disadvantage were removed, after which 60 groups were established. They were then paired randomly to be distributed as three survey papers, each with 10 pairs of selections.

Graduate school students majoring in agriculture explained the survey to the respondents and announced that it was a one-time visit. Each respondent was asked to imagine MFA, and, under

[15] It was set to a value more than 95% of the D-efficiency value

the assumption that they were willing to visit rural areas for recreational purposes, they were asked to choose a desired area from the attribute choices. This model assumes that the IIA in the conditional logit model estimates does not significantly distort the alternatives. In terms of alternative selection, the model was constructed for alternatives 1 and 2, recreational opportunities with a combination of fractional factorial designs that are unique to each other, and alternative 3, staying at home, was suggested to avoid limiting the characteristic combinations of alternatives.

The survey was conducted in May 2017, targeted individuals aged between 20 and 70 years and considered their origin of birth, using the stratified method as a means of avoiding differences in local tendencies. A survey of 250 respondents was conducted in the Seoul bus and train station, with high traffic, and the possibility of gathering all the county residents and characteristics of the survey are in Table 6.2.

Table 6.2 Characteristic of survey sample (n = 250)

Characteristics		Results (%)
Gender	Male	42.4%
	Female	57.6%
Age	Years (average, std dev.)	39.5±12.6
Marital status	Married	57%
	Single	42.9%
Region	Near Seoul (capital) (50% live near Seoul)	63%
	Middle of South Korea	25%
	South of South Korea	12%
Household income	≤$10,000	5.6%
	$10,001–$20,000	12.5%
	$20,001–$35,000	32.6%
	$35,001–$50,000	16.9%
	$50,001≤	32.2%
Education	Up to high school graduate	21.7%
	College	56.6%
	Postgraduate	21.6%

3. Analysis model

To estimate the MFA value using a selective experiment, the probability of individual *n* choosing alternative *j* can be expressed as a linear function in equation (6.1), where no_{nj} is person *n*'s right not to choose obtained from choosing ③ in Table 6.3.

$$P_{nj} = \left(1 - No_{nj}\right) \times \left(\beta_1\left(\chi_{1nj} \times 1.1\right) + \beta_2\chi_{2nj}, \ldots, +\beta_k\chi_{knj}\right) + \beta_{no}\chi_{nonj} + \varepsilon_{nj} \qquad (6.1)$$

where: No mean that the respondent selects stay at home ③ (if chosen = 1; otherwise = 0)
χ_1 is the travel cost;
χ_2,…, χ_k are variables;
χ_{no} is the no variable.

In this chapter, each individual responding to a 10-experiment combination is considered to be independent of individual selection. There may be a dependent relationship between the choices since they were made by a single individual. However, the issue does not seem to be important since all the combinations were randomly selected. Furthermore, IIA does not affect the tendency to choose alternative 3 in Table 6.3 in terms of the ratio of the selection of each combination, assuming the logit model, and the utility function can be assumed to have holistic independence determined by 1 and 2.

Table 6.3 Examples of the MFA opportunity questions

No. 1	①	②	③
Agricultural production dependence (%) (very high = 100) (medium = 50) (very (low = 0)	55	20	Stay at home
Eco-friendly/conventional agricultural area	Eco-friendly area	Conventional area	
Excellence in landscape	Good	Normal	
Agricultural biodiversity – fireflies, frogs, sawyers, etc. (species/h)	33	18	
Resource recycling, multi-variety small-scale production/single-variety high-input large-scale production	Resource recycling, multi-variety small production	Resource recycling, multi-variety small-scale production	
Degree of renewable energy usage and independence – solar, wind power, etc. (%)	0	45	
Conventional fresh/processed direct product sales market	◯	◯	
Organic fresh/processed product direct sales market	X	X	
Restaurant	◯*	◯	
Type of facilities' materials	Shelter	Bricks	
Experience activities	Nature break	Field trip	
Accommodation type	Campsite	Farm stay	
Distance (km)	120 km	220 km	
Choice	☐	☐	☐

To observe the degree of WTP change as the attributes of MFA change, the indirect utility for each (damaged) attribute before the change is set as V_{nj}^{0}, and V_{nj}^{1} is the utility afterwards. The compensating variation generated at this point can be derived using equation (6.2):

$$CV = \frac{1}{\mu}\left[ln \sum_{j=1}^{J} \exp(V_j^0) - ln \sum_{j=1}^{J} exp(V_j^1) \right] \tag{6.2}$$

On the other hand, the conditional logit model proposed by Mcfadden (1974) is widely used due to its relatively simple model estimation and result interpretation but has a limitation in that it does not sufficiently reflect respondents' preference heterogeneity due to the rigid assumption of the model. If this preference heterogeneity is not adequately explained, it may cause a problem in that the market value cannot be accurately estimated due to the heterogeneity of the value estimation results from the diversity of choice behaviours. In general, preference heterogeneity can be divided into systematic preference heterogeneity related to the respondent's observed characteristics and preference heterogeneity related to the respondent's unobserved characteristics. Cases that cannot be excluded require a more general model (Train, 2013). In general, models that relax the rigid assumption of the conditional logit model include the mixed logit, the latent class model, the multinomial probit, and the heteroscedastic extreme value (HEV) model (Louviere et al., 2000, Yoo, 2012).

In this chapter 6, the multinomial probit model was applied to solve the heterogeneity according to the IIA assumption of conditional logit analysis. The multinomial probit model assumes that the three random variables $\varepsilon_n = (\varepsilon_{n1}, \varepsilon_{n2}, \varepsilon_{n3})$ follow a multivariate normal distribution with a mean of 0 and a covariance of Ω. If it is a set of random variables that are $B_{nj} = (\varepsilon_n . s.t. U_{nj} > U_{nj} \; \forall \, j \neq i)$ that is, a set of random variables that will cause the *n* decision maker to choose the *i* alternative, the selection probability in equation (6.3).

$$P_{nj} = \int_{\varepsilon_n \in B_{nj}} \phi(\varepsilon_n) d\varepsilon_n \tag{6.3}$$

Where $\phi(\cdot)$ is Normal distribution density function

Although this equation is a three-dimensional integral problem, in actual analysis, the choice

problem can be solved using the difference in satisfaction for each alternative, so it is simplified to a two-dimensional integral problem, and the covariance matrix Ω is also reduced to a quadratic matrix (Train, 2003).

Equation (6.3) has a problem in that it is impossible to obtain an estimate that directly maximizes the likelihood function because the selection probability includes multiple integrations. Therefore, GHK (Geweke, 1989: Hajivassiliou and Mcfadden, 1998; Keane, 1994) simulation was used in Stata. 14. The asmprobit function was used, and the method of extracting the Halton sequence 150 times was used to generate the random variables required for the simulation.

Since Equation (6.3) the selection probability includes multiple integrals, there is a problem that an estimate that directly maximizes the likelihood function cannot be obtained. Therefore, the asmprobit function of the Stata14 program was used for the GHK (Geweke, 1989: Hajivassiliou and Mcfadden, 1998; Keane, 1994) simulation, and the random variables required for simulation were generated. For this purpose, a method of extracting the Halton sequence 150 times was adopted.

4. Results

The travel cost was used as the distance for the value estimation of each attribute's beneficial effect due to the difficulties in determining the travel cost on various attribute levels and the difficulties faced by respondents in making their decisions. The measurement result using rural tourism and national statistics was stated to convert the distance into the cost. Among the total average expenditure of USD 96, the round-trip fuel cost was USD 31 and was converted into the 2011 gas price/L, then the gas price/L was converted again into the price per distance of USD 1.1, calculating L as the fuel efficiency of 10 km per car, thereby making the distance cost equal to distance × USD 1.1. In terms of the average rural area experience cost, the 2.3% and 3% economic growth rates for 2012 and 2013 were applied, respectively, as well as 3.5% for 2014, as reported by the OECD, to the nominal price of the cost per distance.

Surprisingly, significant results could not be obtained with respect to the importance of agricultural production dependence (meaning a purely agricultural area and abundant rurality) or they were significant yet considered to be unimportant because visitors did not take into

consideration the importance of farmers' dependence on agriculture. Such results appear to be caused by a) the tendency of the respondents to perceive recreational activities and agricultural production dependence to be dissimilar (unrelated) or the respondents being somewhat unfamiliar with the concept of MFA; or b) the tendency of the respondents to focus solely on recreational activities rather than production activities. It is understood that, to estimate the benefit of agricultural production dependence, it must be separated from MFA or classified by key agricultural production dependence to estimate the element-specific value of agricultural production dependence, using the overall value estimated by the CVM.

It can be inferred that the preferences, according to the behaviour of the subjects regarding recreation facilities in the form of MFA, are related to the individual benefit that can be obtained from agriculture in the form of facilities or multifunctional attributes similar to those in urban areas and advanced technology. The deepening strategy attributes also estimated that a market for organic farm produce was considered to be preferable to a conventional farm produce market and that wooden structures were preferred to steel structures for farm facilities. However, the existence of farm restaurants, bricks and shelter were not significant.

In terms of the broadening strategy, nature breaks were preferred to field trips, whereas experiencing ecology was a much-preferred activity. Regarding accommodation, Hanok (Korean traditional house) and farm stays did not return significant results, whereas hotels were preferred to campsites. Such tendencies lead to the conclusion that the main purpose of recreation in rural areas lies in relaxing the body and mind rather than travelling per se and that staying in rural areas is considered to be inconvenient. For the development of MFA, an improvement in farmers' education to achieve a more intimate relationship between facilities and the environment is required. This is because people find it very interesting to enjoy leisure in the countryside, but are dissatisfied with the inconvenience of facilities, comfort, and accommodation in the countryside.

Regarding the regrounding strategy, as expected, the landscape displayed the highest preference level, although environmentally friendly rural areas showed a similarly high preference level. Significant results were also obtained for biodiversity. A much higher level of

Table 6.4 Results and simulations

Strategy	Attribute (variable)	Description	Conditional logit		Multinomial Probit	
			Model (1)	Model (2)	Model (3)	Model (4)
	Agricultural production dependence	Percentage	0.00164	0.00149	0.00026	0.00023
DPN (deepening)	Conventional farm produce market	Yes = 1, no = 0	–0.22653***	–0.21414***	–0.036***	–0.03356***
	Organic farm produce market		0.16784	0.16395	0.02667	0.0257
	Restaurant		–0.01943	–0.01924	–0.00309	–0.00302
	Steel	vs. wooden	–0.19108**	–0.01009**	–0.03036**	–0.00158**
	Brick		–0.00432	0.00013	–0.00069	0.00002
	Shelter		–0.02693	–0.03209	–0.00428	–0.00503
BDN (broadening)	Nature break	vs. field trip	0.47896***	0.46175***	0.07611***	0.07237***
	Harvest/cooking		0.1695	0.17589	0.02694	0.02757
	Handicrafts		0.09532	0.0849	0.01515	0.01331
	Eco-experience		0.22508***	0.23129***	0.03577***	0.03625***
	Hanok	vs. hotel	0.11478	0.12934	0.01824	0.02027
	Campsite		–0.29981***	–0.30226***	–0.04764***	–0.04738***
	Farm stay		–0.15911	–0.1577***	–0.02528	–0.02472
RGN (regrounding)	Environmentally friendly rural areas	Yes = 1, no = 0	0.30821***	0.31309***	0.04898***	0.04907***
	Landscape	G = 2, N = 1, B = 0	0.36461***	0.37296***	0.05794***	0.05846***
	Biodiversity	3/18/33 sp./1 hour	0.00834***	0.00885***	0.00133***	0.00139***
	Renewable energy usage	Percentage	0.00199	0.00202	0.00032	0.00032
	Resource recycling agriculture	Yes = 1, no = 0	0.06162	0.06305	0.00979	0.00988
Individual factors	No[1)]		–2.89787***	–2.23512***	–0.46051***	–0.35033***
	Gender × travel cost (TC)			–0.00118		–0.00018
	Gender × No			0.16351		0.02563
	Age × travel cost (TC)			0.00011***		0.00002***
	Age × No			–0.01523		–0.00239
	Income × travel cost (TC)			–0.0000***		0.000001***
	Income × No			–0.00047		–0.00007
	TC = (distance × USD 1,1)		–0.00227**	–0.00036***	0.00316**	–0.0005**
	Log likelihood		-1759	-1719.1327	-1747.9165	-1715.37
	Pseudo R^2 /Estat R^2		0.3594	0.3665	0.9877	0.9319

Note: 1) 'No' is a dummy variable defined as 1 when alternative 3(stay at home) was chosen on the questionnaire, and 0 otherwise.

2) *** under 3% and ** under 5% of the $p-value$.

preference was shown for the regrounding strategy than for the deepening or the broadening strategy, indicating that visitors reacted far more sensitively to the landscape and environment for MFA.

Models (1) and (2) reflected the marginal effect using conditional logit model to compare attributes' result values, considering changes in the level of difference in the attribute parameters. Summarizing the individual preferences for MFA under the estimation coefficients, Model (1) excluded individual tendencies.

It was observed that visitors gained the highest benefit from a nature break (0.4617) in green rural areas, an excellent landscape (0.3729), environmentally friendly rural areas (0.3130) and securing safe agricultural food production and biodiversity (0.0013), followed by eco-experience (0.2312) and field trips to high-biodiversity areas.

In the case of probit models (3) and (4) considering heterogeneity, the change and rank of significant values by attributes were the same as in models (1) and (2), but the coefficient value was estimated to be smaller. Similarly, the attributes that showed a positive result value based on Model (4) considering individual attributes where it was observed that visitors gained the highest benefit from a nature break (0.0723), landscape (0.05846), environmentally friendly areas (0.04907), eco-experience (0.03625) and biodiversity (0.00139). To summarize, the most-preferred recreational activity for MFA is related to green, environmentally friendly rural areas with a beautiful landscape where nature breaks are available.

To interpret the implications of the two logit and probit models.

First, in the deepening strategy, selling conventional agricultural products is not strategically desirable, and operating an eco-friendly agricultural product store and restaurant together does not give much preference value. In addition, when materials preference for facilities, it is better to use wood materials rather than steel materials, and the selection criteria for bricks and shelter are ambiguous.

According to the broadening strategy, people prefer to relax in nature in rural areas, so it is important to prepare a space for quiet rest, and it is also good to provide eco-friendly experience activities. On the other hand, the harvest experience or activities of making handicraft products are not a strategic choice attribute. Regarding accommodation, it was found that visitors were more likely to prefer staying in hotels in urban areas than camping or homestay in rural areas.

In the regrounding strategy, it was investigated that it is a part related to the environment or landscape, and the visitor very much prefers to visit an eco-friendly agricultural area, a place with a great landscape, and an area rich in biodiversity. All three of these attributes are related to the rural environment and provide important policy implications for the improvement of the rural environment. However, it was difficult to observe an important point in resource recovery or renewable energy production.

To summarize the result of two models, the most-preferred recreational activity for MFA is related to green, environmentally friendly rural areas with a beautiful landscape where nature breaks are available. For nature breaks with recreational purposes, regrounding activities, such as natural and eco-friendly agriculture, must be a priority. In other words, for a multifaceted approach to agricultural policy for rural development, such as the MFA of Europe or the sixth industrialization movement of Japan and South Korea, adding value through agricultural processing and local food restaurants, deepening through eco-friendly intensification, broadening of the available service industry, landscape improvement through rural environment development, eco-friendly agriculture improvement to conserve biodiversity and the provision of safe food and, lastly, regrounding activities, such as increased resource recycling and environmentally friendly sustainable agriculture, constitute the most important factors.

Models (2) and (4) in Table 6.4 were tested for the existence of an interaction between the attribute variables and the respondents' gender, age and income. Overall, the individual attribute variables did not show any stochastic significance. The results suggested that longer-distance and higher-cost travel to rural areas were preferred by older people and lower-income people rather than by young and higher-income people. Such a finding indicates that respondents with young age or higher income had a tendency to seek travel that involved non rural area or somewhat shorter distances, whereas the older and lower-income groups can be seen to prefer long-distance travel to rural areas.

A significant attribute variable compensation surplus can be estimated, as shown in Table 6.5, using Haab and McConnell's (2002) marginal MWTP estimation method and the coefficients from Models (1) and (3). MWTP refers to a one-time payment per household for each unit of improvement of individual attributes.

Table 6.5 Estimated value of attributes of MFA per household (USD)

	Attributes	Model (1)	Model (3)
DPN (deepening)	Conventional farm produce market	–67.7	–11.3
	Steel	–6.1	–9.6
BDN (broadening)	Nature break	146.	24.0
	Eco-experience	73.1	11.3
	Campsite	–95.6	–15.0
RGN (regrounding)	Environmentally friendly rural areas	98.9	15.5
	Landscape	117.7	18.3
	Biodiversity	2.8	0.4

It is more important to show that there is value than the result of value, but the IIA assumption can be rejected and value is presented using model (3) excluding individual tendency as follows.

The attribute that held the highest rating and value for promoting the multifunctional nature of agriculture happened to be the nature breaks of the broadening strategy. It was estimated that, for each household taking a nature break, there was USD 24 worth of benefit, whereas the figure was USD 11.3 for eco-experience, though staying at a campsite rather than a hotel reduced the benefits.

For the regrounding strategy, the benefit was observed to increase to USD 18.3 when the landscape was beautiful, with an increase of USD 15.5 being observed per environmentally friendly rural area ratio increase. In addition, a secure ecosystem and moderate levels of biodiversity (reflected by observations of more than 15 sp./1 hour) increased the benefit by USD 0.4. In contrast, in the case of deepening, a negative surplus was indicated for a conventional farm produce market; non-sustainable and cold materials, such as steel, also caused a negative surplus.

5. Conclusion

This chapter sought to determine the relationship between attributes of MFA by estimating the benefits generated from rural area field trips in terms of predicting the development of comprehensive agriculture, such as the sixth industrialization movement or MFA, with particular relevance to the assessment of the importance of agricultural production dependence, under the assumption that the social and existence values depend on the activity level.

Furthermore, an assumption was made that gradual development is necessary for MFA through the adaptation of the triangular multifunctional agricultural policy (namely deepening, broadening and regrounding) developed by van der Ploeg and Roep (2003) as the future developmental model of MFA or the sixth industrialization movement. Using this model, 11 attributes were structured, and the benefits of each attribute were estimated for later use in a stated preference model to assess the values of and preferences for each attribute.

First, the hypothesis that – in terms of assuring agricultural production dependence for MFA – a significant preference value will be detected was rejected due to statistically insignificant results or minor effects even when significant. Such a result allows the prediction that MFA can be regarded as an aspect that is completely different from conventional agriculture or that, in terms of recreation, one has a strong tendency to fulfil self-objectives and not consider production activity as recreation.

Second, the multifunctional agricultural value triangle is defined as deepening, broadening and regrounding; however, in terms of carrying out MFA development strategies, the natural environment and landscape improvement might consequently be a priority. As a second step, the conclusion could be reached that the broadening and deepening strategies might be carried out at the South Korean political level.

For the regrounding strategic policy, active support from the government is needed because, in many cases, agricultural environment-related issues, such as environmentally friendly rural area complexes, environmental improvement and landscape and biodiversity conservation, tend to be overlooked or avoided. It was also not possible to draw out a result in terms of the deepening and particularly broadening strategies in which a short-term outcome cannot be achieved or where the longer-term regrounding strategy does not take place. Additionally, agricultural production dependence seemed to be either an essential factor or an uninteresting one for citizens. Assuming that a citizen visits a multifunctional agricultural area for recreational purposes, a fair landscape (USD 18.3) and a nature break (USD 24) in an environmentally friendly agricultural area (USD 15.5) with unspoiled nature turned out to be the most-preferred option.

This chapter does not end by merely estimating the values of the individual multilateral functions of agriculture but also separates the South Korean MFA into 11 attributes to estimate

their benefits as farm income resources, which are generated in parallel with agriculture, a process that is currently being undertaken. While van der Ploeg composed MFA into the horizontal value triangle of deepening, broadening and regrounding, this chapter suggests that the regrounding strategy must take priority to increase the environmental values provided by MFA. On the other hand, to explain the non-significance of agricultural production dependence, despite the apparent relationship between agricultural productivity and MFA, whereby MFA cannot proceed without agricultural production dependence, further research on this topic is needed.

Furthermore, the test was limited as the test subjects had difficulties in making decisions because of the presence of too many variables. Another study is necessary to support the results of this research in which a single multifunctional agricultural area is assigned using the revealed preference model analysis method as well as the values of each attribute.

Chapter 7 Conclusion and Policy Implications

This study is economic valuation research on the MOA and MFA, which intended to propose effective ways of creating a comprehensive rural policy utilizing the MOA by applying economic valuation of CE method. It includes a discussion about several studies centred on the MOA, the difference between the sixth industrialization of South Korea and European MFA and the importance of ecological agriculture in the future. The main purpose of this study was to criticize the policy position on agriculture in the past as focusing on economic income-oriented policies and to understand the importance of the MOA socially, enabling people to pursue sustainable agricultural activity. It was intended to argue that it should be transformed into a spatial economic activity system that utilizes all the functions of rural areas, encompassing nature, history, culture, the environment and the landscape. Procedural validation in three steps was performed when carrying out this study.

First, in Chapters 2 and 3, which are theoretical studies, theories on the MOA and theoretical discussions on MFA in Europe were presented. Through this theoretical analysis, it can be founded that there was a general error in Korea's agricultural policy. It acknowledged the existence of MOA, but there was a problem in excluding the externality from the concept of agricultural income. This point of view is that the problem of distortion of the market has arisen from the viewpoint of separating externalities from the agricultural production economy as a policy, and the problem solving is viewed only from simple compensation. As a result, the farm households did not recognize the external effects of agriculture as a resource that farmers generate, resulting in their views on environmental improvement and resource conservation being reversed. On the other hand, in Europe, agriculture was a spatial concept and externalities were recognized as a part of agriculture, and policies were pursued from an integrated perspective. Therefore, attempts to integrate agricultural policies and improve the rural environment by farmers have diversified. These theoretical discussions and cases could suggest a policy theory that enables farmers to make efforts to receive direct compensation for the market failure due to externalities. Therefore, it was necessary to MFA study utilizing the value of non-agricultural resources and converting them into farmhouses income.

In other words, since the above theoretical basement was necessary, it was necessary to prove

the existence value of MOA in Chapter 5. If positive value of MOA actually exists, economic activities such as MFA in which farmers can receive direct compensation are possible by using them, and thereby, a sustainable economy in which farmers can preserve MOA on their own is completed. In fact, in Chapter 5 MOA Valuation, a total of 4 representative MOA were extracted by OECD, FAO, and previous studies. Accordingly, the value of MOA was existed and confirmed and proceeding the next step for valuation of the MFA economic activity program suggested by Ploeg and Rope (2003) was applied to the virtual Korean situation with classified into 11 attributes of 3 strategies (environment-related regrounding, enterprising market activity-related deepening, and hospitality business-related broadening) and that value of combination was estimated. As a result of the estimation, it has been proven that the value is much higher than that of MOA, and in particular, the value of the environmental field related to regrounding is more attractive to consumers. The results implied in Chapters 5 and 6 are that there are various positive externalities in agriculture, and compensation for the corresponding values is required. If the value is used to generate income for the farmer, the farmhouse will make an effort to preserve the environment, and consumers will be able to pay higher than current.

Combining the economic values of MOA and MFA in Chapters 5 and 6 with the theories in Chapters 2 and 3, These can obtain some results.

First, with regard to the research theory and results, MOA cannot divide from agriculture and 6th industrialization is also promoted as a part of agriculture. (1) Thus 6th industry income-oriented economy should be changed to spatial agriculture that encompasses environment, culture, history, and nature. (2) By the value of MOA has positive existence, thus it has been recognized as social resources preserved and the second valuation, MOA can be utilized as economic activities and MFA can be one of the method for eliminating market failure. In addition, if farmers recognize the importance of MOA and add the value to products and economic activities, farmers and regions can be eliminated the market failure of agriculture by themselves. it is a future-oriented way, and sustainable agricultural development is possible

Second, in relation to the policy implication, (1) if government focuses on maintaining the MOA rather than Economic growth in agriculture, MOA may be damaged, or market failure may become even greater. (2) and agriculture is not a part, it is systemic value chain. Therefore,

the departments of government must be cooperative. (3) There was a lack of interest in the importance of agricultural production activities. we need a campaign on the importance of agriculture, the public lacks awareness of the value of agricultural production activities.

Lastly, since this study evaluated the virtual MOA and MFA as a stated preference method study, it can be seen that the average value of Korea was evaluated. However, the actual value of national compensation or MOA differs by region and agricultural type, so a revealed preference method or direct investigation is required. MFA also recognized the importance of environmental resources through this analysis, so it may be necessary to empirically analyse MFA cases related to environment, processing, and tourism.

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Appendix 1: First-Step Questionnaire

Valuing the multifunctionality of rural villages using a choice experiment (A type)

We are conducting surveys to avoid the indiscriminate development of rural villages and to evaluate the social significance of traditional rural villages and effective rural development by estimating the value of each village.

Your response is completely anonymous. An aggregated summary will be released only after final grades have been submitted.

Please mark as shown

① Yes ① No

Researcher: Jung, Hyunhee (h2jung@cni.re.kr)

Place:_____ Date:_____ Pollster:

※ **Please answer below:**

1. Where are you living now? (Until county and ward)

(city/state/ county/ward)

2. Have you lived in a rural area for more than 1 year?

① Yes ② No

3. Do you know a person who lives in a rural area as a farmer?

① Yes ② No

4. What is your primary purpose for visiting rural areas?

① Visiting friends and relatives ② Healing ③ Excursion

④ Picking and cooking ⑤ Eco tour ⑥ Purchasing farm produce

⑦ Residence ⑧ Education ⑨ etc. ( )

5. Have you ever heard about the multifunctionality of agriculture?

① Yes ② No

6. What is the most important function in farm villages and rural society?

① Agricultural production ② Social and environmental function

③ Historical and cultural function ④ Economic function

7. Imagine yourself in a typical rural village.

You can grow up in the countryside or think about the rural village where your grandfather, grandfather or grandfather lives and answer the questions. Assuming that the rural village was damaged by the items presented, how much are you willing to pay to improve the damaged village? Please choose the most reasonable alternative for each question. If items ① and ② are not reasonable or there is no intention to pay, select item ③. (**Pay only once**)

1)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C*	B	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	B	C	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	C	C	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	C	C	
Improvement cost for conservation (only once)	3,000 KRW	3,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

2)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	A	B	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	A	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	C	B	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	B	C	
Improvement cost for conservation (only once)	7,500 KRW	14,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

3)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C	A	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	C	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	B	B	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	A	C	
Improvement cost for conservation (only once)	7,500 KRW	14,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

4)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	B	B	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	A	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	A	B	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	B	B	
Improvement cost for conservation (only once)	3,000 KRW	3,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

5)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C	C	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	B	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	B	C	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	B	A	
Improvement cost for conservation (only once)	7,500 KRW	11,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

6)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C	B	I do not wish to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	A	A	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	C	A	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	A	A	
Improvement cost for conservation (only once)	11,000 KRW	11,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

7)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	A	C	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	B	C	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	A	C	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	B	A	
Improvement cost for conservation (only once)	11,000 KRW	7,500 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

8)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	B	B	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	A	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	C	A	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	A	B	
Improvement cost for conservation (only once)	7,500 KRW	7,500 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

9)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C	C	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	B	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	A	B	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	C	C	
Improvement cost for conservation (only once)	14,000 KRW	14,000 KRW	
	☐	☐	☐

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

10)	①	②	③
Degree of damage to the natural environment (the ecosystem, air, water quality, environment, soil, etc. are damaged)	C	B	I do not want to pay for this situation
Degree of damage to historical and cultural resources (cultural assets, pavilions, totemism, houses, stone walls and folktales disappear or are damaged)	C	C	
Deterioration of rural village scenery (green or golden fields shrink, forest degradation, etc.)	A	A	
Degree of disappearance of public activity (ceremonies, pumasi, clan events, holiday play, etc.)	C	A	
Improvement cost for conservation (only once)	3,000 KRW	14,000 KRW	
	□	□	□

* A equals a case of 0% damage, meaning well preserved, B equals 25% damage and C equals 50% damage.

8. Gender

① Male ② Female

9. Age ( )

10. Are you married?

① Yes ② No

11. Highest academic achievement

① Elementary school ② Middle school ③ High school

④ University ⑤ Graduate school or more

12. Occupation

① Salaried man ② Entrepreneur ③ Official

④ Farmer or fisherman ⑤ Specialized position ⑥ Engineer

⑦ Housewife ⑧ Student ⑨ ( )

13. Wage per month (monthly wage of household including tax)

① 1 million won ② 1 ~ 1.49 million won ③ 1.5 ~ 1.99 million won

④ 2 ~ 2.49 million won ⑤ 2.5 ~ 2.99 million won ⑥ 3 ~ 3.49 million won

⑦ 3.5 ~ 3.99 million won ⑧ 4 ~ 4.99 million won ⑨ more than 5 million won

Thank you

Appendix 2: Second-Step Questionnaire (A Type)

Valuing rurality and the regrounding, deepening and broadening of MFA

Your response is completely anonymous. An aggregated summary will be released only after final grades have been submitted.

Please mark as shown

① Yes ② No

Researcher: Jung, Hyunhee (h2jung@cdi.re.kr)

Tel.: 041)**0-1218

FAX: 041)**0-1219

Place:_____ Date:_____Pollster:_____.

※ **Please answer below:**

1. Where are you living now? (Until county and ward)

(city/state/ county/ward)

2. Have you lived in a rural area for more than 1 year?

① Yes ② No

3. Do you know a person who lives in a rural area as a farmer?

① Yes ② No

4. What is your purpose for visiting rural areas normally?

① Visiting friends and relatives	② Healing	③ Excursion
④ Picking and cooking	⑤ Eco tour	⑥ Purchasing farm produce
⑦ Residence	⑧ Education	⑨ etc. ( )

5. Have you ever heard about the multifunctionality of agriculture?

① Yes ② No

6. Have you ever heard about multifunctional agriculture?

7. What is the most important function in the farm village and rural society?

① Agricultural production	② Social and environmental function
③ Historical and cultural function	④ Economic function

8. This question is just a virtual situation.

Imagine a village that will serve diverse farming experiences, with accommodation that is not free of charge, as shown in the table below (①②③). The alternatives and the services and information of villages are either conventional/environmentally friendly agriculture, biodiversity and diversified agriculture (resource circulation method). If you are planning to visit a village with your friends, family or loved ones, which of the following alternatives is attractive to you? Please choose only one alternative. If alternatives ① and ② are not attractive to you, please choose ③. (Pay only once)

1)	①	②	③
Agricultural production activity: very active = 90%	55%	20%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Conventional field	
Sightseeing	Good	Normal	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	35	18	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Resource circulation small-quantity batch production	
Energy independence (solar, manure, wind, etc.)	0%	50%	
Direct selling	o	o	
Organic farm produce and product sales	x	x	
Restaurant	o	o	
Travel facilities' structure	Shelter	Brick/concrete	
Experience activity	Healing	Excursion	
Accommodation	Camping site	Farm stay	
Distance (from your residence)	120 km	220 km	
Choice	☐	☐	☐

2)	①	②	③
Agricultural production activity: very active = 90%	20%	55%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Environmentally friendly agriculture field	
Sightseeing	Normal	Good	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	35	18	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Mass plantation	
Energy independence (solar, manure, wind, etc.)	0%	90%	
Direct selling	x	x	
Organic farm produce and product sales	o	o	
Restaurant	x	x	
Travel facilities' structure	Shelter	Steel	
Experience activity	Home crafts	Healing	
Accommodation	Campsite	Farm stay	
Distance (from your residence)	170 km	170 km	
Choice	☐	☐	☐

3)	①	②	③
Agricultural production activity: very active = 90%	55%	55%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Conventional field	
Sightseeing	Normal	Normal	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	35	3	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Resource circulation small-quantity batch production	
Energy independence (solar, manure, wind, etc.)	90%	90%	
Direct selling	o	o	
Organic farm produce and product sales	o	x	
Restaurant	x	x	
Travel facilities' structure	Shelter	Steel	
Experience activity	Eco tour	Excursion	
Accommodation	Campsite	Farm stay	
Distance (from your residence)	70 km	170 km	
Choice	☐	☐	☐

4)	①	②	③
Agricultural production activity: very active = 90%	55%	55%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Conventional field	Environmentally friendly agriculture field	
Sightseeing	Good	Bad	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	18	18	
Resource circulation small-quantity batch production/mass plantation	Mass plantation	Mass plantation	
Energy independence (solar, manure, wind ,etc.)	50%	90%	
Direct selling	x	x	
Organic farm produce and product sales	x	x	
Restaurant	o	o	
Travel facilities' structure	Wood	Shelter	
Experience activity	Excursion	Picking and cooking	
Accommodation	Campsite	Hanok	
Distance (from your residence)	70 km	220 km	
Choice	☐	☐	☐

5)	①	②	③
Agricultural production activity: very active = 90%	90%	90%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Conventional field	Environmentally friendly agriculture field	
Sightseeing	Bad	Good	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	18	3	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Mass plantation	
Energy independence (solar, manure, wind, etc.)	50%	50%	
Direct selling	x	x	
Organic farm produce and product sales	x	x	
Restaurant	o	x	
Travel facilities' structure	Shelter	Wood	
Experience activity	Home crafts	Excursion	
Accommodation	Hotel or resort	Campsite	
Distance (from your residence)	170 km	170 km	
Choice	☐	☐	☐

6)	①	②	③
Agricultural production activity: very active = 90%	20%	55%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Conventional field	
Sightseeing	Bad	Bad	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	35	3	
Resource circulation small-quantity batch production/mass plantation	Mass plantation	Resource circulation small-quantity batch production	
Energy independence (solar, manure, wind, etc.)	90%	50%	
Direct selling	o	x	
Organic farm produce and product sales	o	x	
Restaurant	x	o	
Travel facilities' structure	Wood	Wood	
Experience activity	Picking and cooking	Picking and cooking	
Accommodation	Farm stay	Campsite	
Distance (from your residence)	70 km	120 km	
Choice	☐	☐	☐

7)	①	②	③
Agricultural production activity: very active = 90%	55%	90%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Conventional field	Conventional field	
Sightseeing	Good	Bad	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	3	18	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Resource circulation small-quantity batch production	
Energy independence (solar, manure, wind, etc.)	50%	90%	
Direct selling	x	x	
Organic farm produce and product sales	x	x	
Restaurant	x	x	
Travel facilities' structure	Steel	Wood	
Experience activity	Picking and cooking	Eco tour	
Accommodation	Hanok	Farm stay	
Distance (from your residence)	70 km	20 km	
Choice	☐	☐	☐

8)	①	②	③
Agricultural production activity: very active = 90%	20%	55%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Conventional field	Environmentally friendly agriculture field	
Sightseeing	Good	Normal	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	3	35	
Resource circulation small-quantity batch production/mass plantation	Mass plantation	Mass plantation	
Energy independence (solar, manure, wind, etc.)	0%	90%	
Direct selling	o	o	
Organic farm produce and product sales	x	x	
Restaurant	x	o	
Travel facilities' structure	Wood	Brick/concrete	
Experience activity	Healing	Excursion	
Accommodation	Hanok	Hanok	
Distance (from your residence)	120 km	170 km	
Choice	☐	☐	☐

9)	①	②	③
Agricultural production activity: very active = 90%	90%	20%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Conventional field	
Sightseeing	Normal	Good	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	18	18	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Mass plantation	
Energy independence (solar, manure, wind, etc.)	0%	0%	
Direct selling	x	o	
Organic farm produce and product sales	o	x	
Restaurant	x	o	
Travel facilities' structure	Brick/concrete	Wood	
Experience activity	Eco tour	Healing	
Accommodation	Campsite	Farm stay	
Distance (from your residence)	20 km	170 km	
Choice	☐	☐	☐

10)	①	②	③
Agricultural production activity: very active = 90%	20%	90%	Any other alternatives
Environmentally friendly agriculture field/conventional field	Environmentally friendly agriculture field	Environmentally friendly agriculture field	
Sightseeing	Good	Normal	
Biodiversity (half dictum, frog, sawyer, etc.): findings per hour	3	18	
Resource circulation small-quantity batch production/mass plantation	Resource circulation small-quantity batch production	Resource circulation small-quantity batch production	
Energy independence (solar, manure, wind, etc.)	50%	0%	
Direct selling	x	x	
Organic farm produce and product sales	o	o	
Restaurant	o	x	
Travel facilities' structure	Shelter	Wood	
Experience activity	Eco tour	Excursion	
Accommodation	Farm stay	Hanok	
Distance (from your residence)	20 km	70 km	
Choice	☐	☐	☐

9 Gender

① Male ② Female

10 Age ( )

11 Are you married?

① Yes ② No

12 Highest academic achievement

① Elementary school ② Middle school ③ High school

④ University ⑤ Graduate school or more

13 Occupation

① Salary men ② Entrepreneur ③ Official

④ Farmer or fisherman ⑤ Specialized position ⑥ Engineer

⑦ Housewife ⑧ Student ⑨ Other ( )

14 Wage per month (monthly wage of household including tax)

① 1 million won ② 1 ~ 1.49 million won ③ 1.5 ~ 1.99 million won

④ 2 ~ 2.49 million won ⑤ 2.5 ~ 2.99 million won ⑥ 3 ~ 3.49 million won

⑦ 3.5 ~ 3.99 million won ⑧ 4 ~ 4.99 million won ⑨ more than 5 million won

Thank you