Evaluating Multifunctional Activities as Rural Institution in Japan

Yasuo Ohe

Department of Agricultural Economics,

Chiba University

648 Matsudo, Matsudo, Chiba, 271-8510, Japan.

E-mail: yohe@faculty.chiba-u.jp

Abstract

The relationship between multifunctionality and the roles of rural communities has not been discussed fully although the connection between the two is an essential issue in the rural policy arena. Pursuing this issue, this paper considers that multifunctional hamlet activities are generated as institutional joint products within the hamlet. Also evaluated is the connection between multifunctional activities and institutional hamlet conditions under the Japanese direct payment program for less favored areas.

Results of conceptual considerations and empirical evaluations reveal that specific multifunctional hamlet activities depend on hamlet conditions; those on the least favorable level tend to perform land preservation activities while those under the most favorable conditions tend to undertake recreational activity. Hamlets participating in forming landscape fall in the middle. Thus, firstly, institutional jointness is not constant but variable depending on hamlet conditions. Consequently, programs to enhance multifunctionality should respect hamlet conditions that represent different levels of institutional jointness of multifunctional activity rather than treat multifunctionality as a single concept. Secondly, for diversification, it would be effective to organize hamlet activities based on an open and wider human network rather than the traditional closed one in rural communities.

1. Introduction

Little attention has been given to the multifunctionality provided by collective action, such as hamlet activities (for multifunctionality issues, see OECD, 2003 from the policy perspective, Van Huylenbroeck and Durand, 2003 from the European perspective and Ohe, 2001 from the Japanese perspective). Yet such multifunctional activities are crucial in promoting multifunctionality from the perspective of community-based agricultural and rural development. In studying this issue, an institutional approach is effective because hamlet activity has been based on the institutional process and such an approach will help to clarify the institutional jointness of multifunctionality (for

institutional jointness, see Hagedorn, 2003).

As such an example of this jointness, a direct payment program for less favored areas was started in 2000 in Japan and has been used to promote multifunctionality in those areas (Yamashita, 2001 explained the purpose and details). This program mandates that the rural community agree to maintain farmland and hamlet activities that promote multifunctionality in the rural community. This is because for centuries the role of the rural community has been essential in farming and in life as an institutional foundation in this country. We feel that this program is an example that implicitly assumes institutional jointness wherein hamlet activity generates multifunctionality.

However, we do not have an effective institutional framework that can be applied to rural community issues because the institutional approach has focused on farm organizations and policy aspects rather than on the rural community (Van Huylenbroeck et al., 2004 took a neo-institutional economics approach to agricultural institutions). We need an institutional framework applicable not only to hamlet activities based solely on the traditional closed human network in the rural community but also to those based on an open human intercommunity network. The latter perspective will become more important in the rural policy arena for identification of new roles for rural communities.

In consideration of this background, this paper focuses on multifunctional activities under the direct payment program and aims to clarify features of multifunctional hamlet activities from a conceptual and empirical point of view. In addressing these aims, we briefly outline the program. Then we explore a conceptual model to deal with institutional aspects of hamlet activity and we estimate empirical multifunctional activity determinant models to clarify the features of multifunctional activities. Finally, we discuss implications for future policy direction in promoting multifunctionality.

2. Data

Data at the hamlet level are not disclosed on a nationwide basis. Therefore, this paper uses data disclosed by the administrative body of this program, the Rural Development Bureau, Ministry of Agriculture, Forestry and Fisheries of Japan (MAFFJ), which is "The Result of the Direct Payment Program in the Hilly and Mountainous Areas 2001," and which were aggregated at the prefectural

level in the 2001 fiscal year. We used the 2001 data that cover all 47 prefectures.

3. Outline of direct payment program and multifunctionality

The program requires a hamlet agreement entered into by hamlets. This is because the program places importance on hamlet functions.

This program has two aims: to preserve farmland and to promote multifunctionality in the hilly and mountainous less competitive areas based on hamlet activities that have been the foundation of farming and rural life for centuries. For this reason, hamlets that want to receive a direct payment are required to sign a hamlet agreement defining what activities they will perform for preservation of farmland and enhancement of multifunctionality as a unit of the local community.

As of 2001, this program was implemented in the 1,900 towns and cities that had hamlet agreements. On average, each hamlet agreement had 19.5 participants, 20 ha of designated farmland, and payment received was 1,630,000 yen and 83,000 yen per capita as shown in Table 1.

Among the hamlet agreement, preservation of land is the most common practice (58.6%), followed by formation of landscape (38.3%). Recreation or rural tourism accounts for only 3.2% of activity. These differences in share suggest that there are different cost levels necessary for each multifunctional hamlet activity. The lowest cost is related to preserving land and the highest cost is related to recreation, with forming landscape in the middle. Therefore, it can be concluded that different multifunctional activities are undertaken depending on the cost-bearing capability of the hamlets; the higher the cost for multifunctional activity, the fewer hamlets conduct that multifunctional activity.

We have characterized multifunctional hamlet activities into two types depending on the orientation of internalization of externality: the non-internalizing type and the internalizing type.

The non-internalizing type is a hamlet activity that is based on traditional hamlet actions such as maintenance of the farm road and irrigation system and preserving farmland. These activities are conventionally institutionalized as collective work to maintain the farm production base in the community. The typical case is land preserving activity, which may not internalize external effects.

Table 1. Outline of direct payment program (as of 2001)

1) Outline of hamlet agreement and payment

Items	Participants (persons)	Covered acreage (ha)	Amount of payment (thousand Yen)	Payment per head (thousand Yen)
Total	613,304	627,736	51,132,000	-
Average per hamlet agreement	19.5	20	1,630	83

2) Farming consistency condition for hamlet agreement

Composition of farming consistency conditions	% of hamlet agreement	Necessary cost-bearing capability for activity
Maintenance of irrigation and farm road lines	73.8%	Low
Exchange of farming operation and joint farming operation	23.7%	Middle
Farming groups or farming corporate bodies	4.0%	High

3) Types of multifunctional activity undertaken in the hamlet agreement

Types of multifunctional activity	% of hamlet agreement	Necessary cost-bearing capability for activity
Land preservation	58.6%	Low
Landscape forming	38.3%	Middle
Recreational	3.2%	High

Source: The Result of Direct Payment Program in the Hilly and Mountainous Areas 2001, Rural Development Bureau, MAFFJ, 2002.
Note: The sum of composition of farming consistency conditions does not equal to 100% because there were cases in which multiple conditions applied.

The internalizing type is a hamlet activity that is undertaken as a new activity such as rural tourism that has not been conventionally institutionalized although this activity could occur on the basis of conventional hamlet activity. Rural tourism is an activity that enables farmers to internalize the externality that has not been rewarded and then create a new income source.

The landscape-forming function will be involving non-internalizing and internalizing activities because this function is considered to be comprised of two features.

4. Conceptual Model

We have endeavored to clarify what and how hamlet conditions influence institutional cost structure and jointness. Figure 1 summarizes the view presented in this paper, wherein we assume that hamlet conditions determine multifunctional activities through the institutional cost structure in the hamlet. This whole process represents the institutional jointness that generates multifunctional hamlet activities. We present a conceptual model that enables us to explore the institutional factors and relationships between hamlet multifunctional activity and hamlet size for a hamlet agreement under this program (we incorporate the idea of the public choice theory, one of the fields of neo-institutional economics, into the conceptual framework. See Buchanan and Tullock, 1962 and Muller, 1980 for
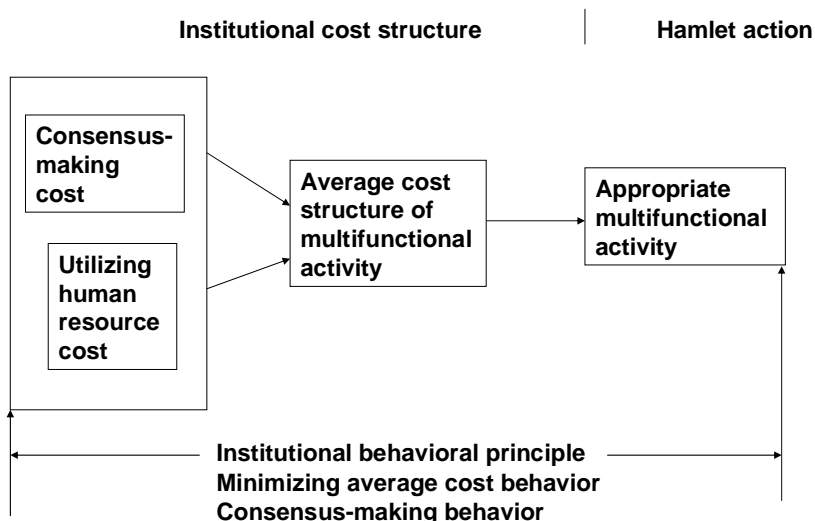
Figure 1. Process of institutional jointness(hamlet function) of multifunctional activity

the public choice theory). First, we assume that farmers in the hamlet act on the principle of minimizing the average cost of the multifunctional hamlet activity rather than on the principle of minimizing marginal cost. This is because hamlet activities have been traditionally maintained by non-profit behavior as collective action for mutual help in the local community. Second, we assume that decision making about hamlet activity is determined by a consensus among hamlet members, which also has been the traditional decision-making method. This program allows farmers to take cost minimizing behavior in the range of a municipality that generally consists of multiple hamlets. Therefore, multifunctional activity would be undertaken not only on a single-hamlet basis, but also on a multiple-hamlet basis.

With the above two assumptions, suppose other conditions are considered as constant and based on the reality of the hilly and mountainous areas, we assume two institutional factors that determine the cost of multifunctional hamlet activities; human resources and consensus-making among hamlet members. Thus, we consider two cost factors; the cost of utilizing human resources and the cost of consensus-making. The vertical sum of the two cost curves becomes the total average cost (AC). Therefore, equation (1) is assumed concerning multifunctional hamlet activity i.

$$AC_i(x) = HC_i(x) + NC_i(x) \qquad (1)$$

Where, $AC_i(x)$ =average cost curve of multifunctional hamlet activity i in the hamlet agreement

$HC_i(x)$ =average cost for utilizing human resources for multifunctional hamlet activity i

$NC_i(x)$ =average cost for consensus-making for multifunctional hamlet activity i

x= size of hamlet agreement

Farmers in the hamlet are supposed to minimize the average cost AC consisting of the two factors and then the optimal size of the hamlet agreement is determined for each activity. This is depicted in Figure 2 showing measurement of the cost level vertically and size of participants in the hamlet agreement horizontally.
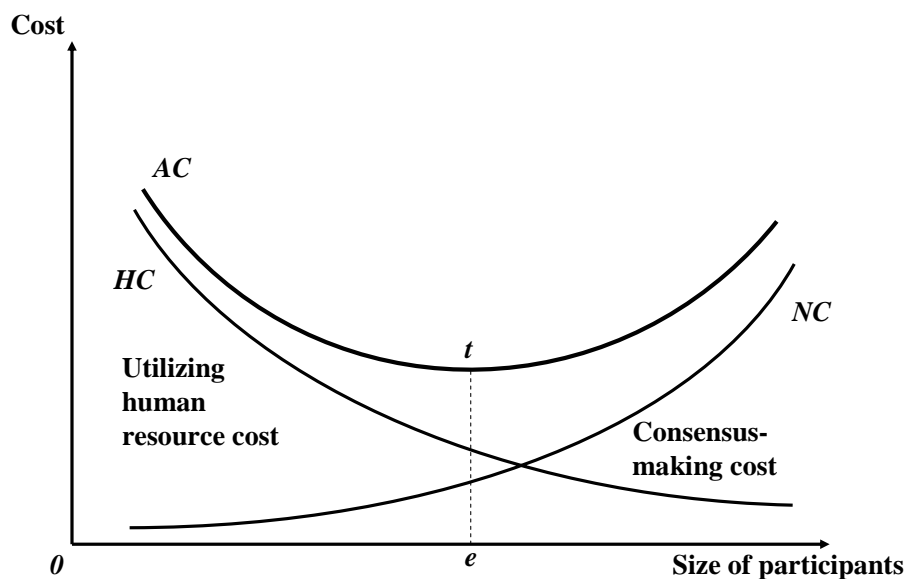
Figure 2 Institutional cost curves for multifunctional hamlet activity

First, the average cost of utilizing human resources has a negative relationship with the size of the hamlet agreement, which is illustrated by the curve *HC*. Utilizing human resources is crucial to conducting hamlet activity but is difficult, especially in hilly and mountainous areas. In the case of little availability of human resources, the cost of utilizing human resources is prohibitive. Therefore, the more you expand the size of the hamlet agreement, the greater the possibility of finding appropriate human resources will be, and then these participants can share the cost of the multifunctional activity. In other words, per capita average cost of utilizing human resources is supposed to be negative or no correlation with the number of participants, meaning that we can expect a rightward-declining curve.

Second, the average consensus-making cost has a positive relationship with size, which is illustrated as curve *NC*. The larger the number of participants, the greater is the increase in transaction cost for reaching consensus. This is because an increase in people involved shifts the pattern of consensus-making from that among acquaintances to that among those not acquainted. Consequently, the average cost for reducing a consensus is non-negatively correlated positive or no correlation with the size of hamlet agreements, meaning that we can expect a rightward-increasing curve.

Third, the vertical sum of the two cost curves results in the total average cost curve (*AC*). Thus the total average cost of multifunctional activity *i* for the optimal size hamlet agreement is determined and *AC* reaches the minimum at point *e* in Figure 2. The optimal size hamlet agreement would consist of a single hamlet or multiple hamlets, depending on the institutional cost factors.

This is the basic conceptual framework of the relationship between multifunctionality and hamlet behaviour, which shows how the total average cost is determined. This study does not evaluate the effects of the direct payment, but evaluates the initial hamlet conditions for multifunctional activities.

Thus the optimal size of each multifunctional activity is determined although the optimal point differs from one area to another depending on the cost structure attributed to local conditions of the institutional factors. Consequently, cost curves are obtained for each multifunctional activity and finally the VC_i curve envelops the AC_i curves of each area at the national level concerning multifunctional activity *i* and VC_j for *j*.

5.   Analytical model

Here we explore how to apply the above conceptual model to an empirical study. The information presented in Table 2 can show how the combination of shapes of the *VC* envelope cost curves influences the two institutional factors. There are four different cases of cost structure.

The first case (Case 1) involves those hamlets that have a high level of hamlet function under favorable conditions. Thus, in Case 1 those hamlets can conduct multifunctional activity sufficiently at a low institutional cost in terms of utilizing both human resources and consensus-making. In this sense, those hamlets have higher cost-bearing capability for conducting multifunctional activity than ordinary hamlets and therefore the institutional jointness is supposedly more stable than in the other cases. For instance, in Figure 3 those hamlets that can conduct this multifunctional activity at the cost *oa* have cost-bearing capacity *ad* if *od* is the maximum cost level for implementing multifunctional activity. Nevertheless, this case hardly represents the majority of actual situations in hilly and

Table 2 Institutional factors of hamlet agreement and shape of cost curves

Status of hamlet agreement	Types	Utilizing human resource cost A	Consensus-making cost B	Total average cost for hamlet agreement C(=A+B)
Yes	Case 1	Low	Low	Diminishing and then increasing
Yes	Case 2	Low	High	Portion diminishing < Portion of decreasing
Yes	Case 3	High	Low	Portion diminishing > Portion of increasing
No	Case 4	High	High	Diminishing and then increasing
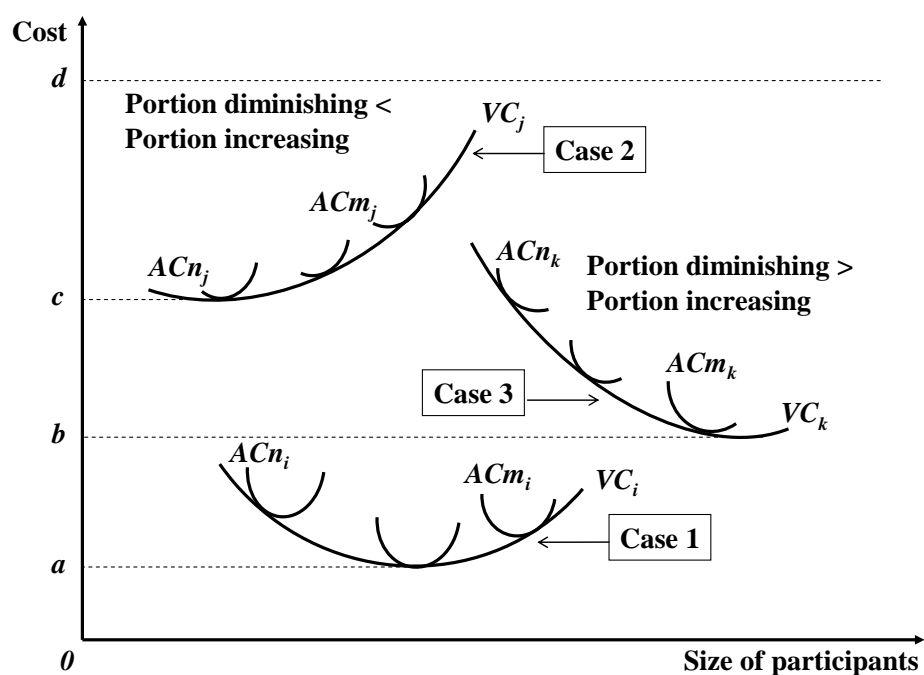
Figure 3 Envelop cost curve for multifunctional activities

mountainous areas because this case is too favorable for ordinary hamlets in these areas.

On the opposite extreme from Case 1, those rural areas with hamlet conditions at a low level inevitably have high costs both for consensus-making and utilizing human resources (Case 4). In this

case, the level of hamlet function is too low to start a hamlet agreement, meaning that the cost-bearing capability is too low, or institutional costs are still too high to bear for those hamlets. We do not expect institutional jointness in this case. This case is not illustrated because this case falls above *od* in Figure 3.

There exist intermediate cases in which hamlet function can be maintained at a level between those extreme cases. Those intermediate cases are not uncommon, and, in fact, in such hamlets one cost is usually higher than the other. For example, in Case 2 the cost of utilizing human resources is low while consensus-making costs are high. Thus, the shape of the *VC* curve indicates that the cost-increasing portion is greater than the cost-decreasing portion, so the right upward portion becomes larger. Conversely, in Case 3, there is a high cost for utilizing human resources and a low consensus-making cost. Therefore, in Case 3, the cost-decreasing portion is greater than the cost-increasing portion, so the right downward portion becomes larger.

These different shapes provide not only information on institutional cost structure, but also on different prospects for multifunctional hamlet activities. In Case 2, it could be more effective to undertake hamlet activities within the traditional community range because it is rational for hamlets in Case 2 to save consensus-making cost. Conversely, in Case 3, it could be more appropriate to undertake hamlet activities in the inter-community range, which suggests that it will be rational to utilize the extended human network beyond a single hamlet boundary.

What we deal with here are only Case 1, Case 2, and Case 3 because Case 4 is not considered to be feasible for a hamlet agreement.

6. Estimation model

We focus on the three multifunctional activities: land-preserving activity, landscape-forming activity, and recreational activity. In fact, data for the cost function *VC* in the conceptual model above are not available, so that it is not possible to estimate the cost function directly. What is observable is the portion of undertaken multifunctional activity in the hamlet agreement at the prefectural level, called variable *Y*. Therefore, under the conceptual framework of cost minimizing behavior we use variable *NY* (=1-variable *Y*) as a proxy variable for the cost for each multifunctional activity. We

expect that the larger the variable *NY* is, the higher the cost for this multifunctional activity is. If the parameter is negative, the variable works favorably for the multifunctional activity and if the parameter is positive, the variable works unfavorably.

The next question is into which case each multifunctional activity actually falls. To clarify this point, we consider a *VC* curve determinant model concerning multifunctional activity *k* as below.

$$NY^k_i = \alpha^k_0 + \alpha^k_1 (x^k_i)^2 + \alpha^k_2 x^k_i + \alpha^k_3 HD^k_i + \varepsilon^k_i \qquad (2)$$

Where, NY^k_i =1 - (portion of undertaken multifunctional activity *k* in prefecture *i*)

x^k_i =participant size of multifunctional activity *k* in prefecture *i*

HD^k_i =regional dummy variable (Hokkaido=1, others=0)

α^k_j =parameter to be estimated, α^k_0 =constant, ε^k_i =stochastic error

Regarding explanatory variables, first we use participant size per hamlet agreement as the explanatory variable of the size of the hamlet agreement. Furthermore, to consider the difference in farm size in Hokkaido, a northern island, from other parts of Japan, we use a regional dummy variable: Hokkaido=1, other prefectures=0. The estimation model is a quadratic function. The estimation method is OLS.

7.   Estimation results

There is a strong correlation between the quadratic and linear terms of size variables (Table 3). Therefore the parameters are not stable and are hard to interpret in detail. This strong correlation between quadratic and linear terms means that the cost curve is a monotonously increasing or decreasing function for size. In other words, either the right downward portion or the right upward portion of the curve is quite large. This suggests that one of the two institutional factors works much more strongly than the other, which does not occur in Case 1 whereby the two factors work evenly. This is one of the main reasons for the serious multicollinearity. Thus we estimated models using only one size variable in quadratic or linear terms. Therefore, we only interpret the signs of the parameters. The results of these cases of single-size variables are also shown in Table 3. Adjusted R^2 is the highest for recreational activity, followed by land-preserving activity and is lowest for landscape-forming activity. This is because land-preserving activity and landscape-forming activity are activities

Table 3 Size of participants and multifunctional activities

Model type	Quadratic and linear			Quandratic			Linear		
Multifunctional activities	Land preserving	Landscape forming	Recreational	Land preserving	Landscape forming	Recreational	Land preserving	Landscape forming	Recreational
Constant	0.2056+	0.8093***	0.9490***	0.3525***	0.6827***	0.9896**	0.1958***	0.8415***	1.0393***
	(1.58)	(6.19)	(45.09)	(13.14)	(25.33)	(221.08)	(3.66)	(15.58)	(97.14)
(No. of participants)^2	0.0000	0.0000	-0.0001***	0.0001***	-0.0001***	-0.0001***	-	-	-
	(0.08)	(-0.27)	(-4.72)	(4.34)	(-4.60)	(-9.98)	-	-	-
No. of participants	0.0103	-0.0089	0.0028*	-	-	-	0.0110***	-0.0112***	-0.0037***
	(1.16)	(-0.99)	(1.97)	-	-	-	(4.56)	(-4.60)	(-7.69)
Regional dummy	0.3428**	0.0646	-0.0312	0.3989**	0.0162	-0.0157	0.3394**	0.0759	0.0006
	(2.15)	(0.40)	(-1.21)	(2.62)	(0.11)	(-0.62)	(2.23)	(0.50)	(0.02)
$ajsR^2$	0.3748	0.2815	0.7066	0.37	0.2819	0.6874	0.3889	0.2967	0.5647
VIF		13.8748			1.0156			1.0435	
CN		19.0863			1.9994			4.896	
White test	ns	ns	ns	ns	ns	ns	ns	ns	ns

Source: same as Table 1.

Note: The t ratios are given in parentheses. Significance levels are shown by the results of the t test, such that ***=1%,**=5%, *=10%,+=20%, n.s. = not significant.

Table 4 Hamlet size and cost structure of multifunctional activities

Multifunctional activities	Size parameter	Area on the cost curve	Types of cost behavior	Necessary level for hamlet function
Land preserving	Plus	Area of right upward: Case 2	Consensus-making cost saving	Low
Landscape forming	Minus	Area of right downward: Case 3	Utilizing human resource cost saving	Middle
Recreational	Minus	Area of right downward: Case 3	Utilizing human resource cost saving	High

commonly undertaken across the nation, which makes the characteristic less apparent.

What is obvious is that linear and quadratic terms have the same sign and the sign is different from one multifunctional activity to another. The sign of land-preserving activity is positive, while the signs of landscape-forming and recreational activity are negative. The interesting point here is that the sign reverses between the former and the latter two. What makes sense here is that in the first quadrant both variables have positive values. In that quadrant the land-preserving activity is monotonously increasing, which means that the right upward portion of the cost curve is large, while the landscape-forming activity and the recreational activity are monotonously decreasing, which means that the right downward portion is large.

In summary, we can characterize the relation between the *VC* cost curve and multifunctional activities in Table 4. First, land-preserving multifunctional activity, as a non-internalizing activity, has the positive parameter of size. This result suggests that the right upward portion of the *VC* curve is large, corresponding to Case 2. Concerning cost factors, we can surmise that the decreasing effect of costs of utilizing human resources is smaller than the increasing effect of consensus-making cost. This is because this type of hamlet activity is not a new activity, so that the cost of utilizing human resources would be low. However, on the other hand, the cost of consensus-making would increase as size grows. In this case it is rational to take the behavior of saving the consensus-making cost. Thus, it is safe to say that this characterizes non-internalizing hamlet behavior well. Put differently, a relatively small size based on the conventional hamlet would be rational.

On the other hand, landscape-forming activity and recreational activity, classified as internalizing or internalizing-related hamlet activities, have negative parameters of size. This case is considered to be that in which the right downward portion of the *VC* curve is large, corresponding to Case 3. This indicates that the decreasing effect of utilizing human resources is greater than the increasing effect of consensus-making cost. Therefore, it is rational to consider cost-saving behavior in utilizing human resources. This means that a group of several hamlets or a wider hamlet network will be effective for these types of activity. This is particularly true in rural tourism activity because often the main participants are middle-aged farming women who are proactive in extending the human network among themselves.

To summarize, the results of the model estimation suggest that there is an apparent difference derived from the cost structure between internalizing hamlet activity and non-internalizing activity. For non-internalizing hamlet activity, factors of consensus-making exert influence on the cost structure, so behavior in saving this cost is taken. Conversely, for the internalizing-related hamlet activity the cost of utilizing human resources is influential and this cost-saving behavior is performed. These results imply that we should take into account the different characteristics of institutional cost structure and therefore different jointness of multifunctional activity.

8.   Conclusions

The following are the main conclusions although we should be careful in generalizing the results to a great extent due to constraints on data and estimation results.

Land-preserving activity is a commonly undertaken hamlet activity because the cost-bearing capability of performing this hamlet activity is rather low, which means that extra cost reduction efforts are not required for these hamlets. Thus this is an example of widely applied institutional jointness.

Recreational activity needs a high level of hamlet function as needed for group farming. This means that there is potential to tackle a new activity based on this high level of hamlet function. In other words, the cost-bearing capability for this activity is so high that only those hamlets that can perform at such low cost can conduct this activity. Thus this type of institutional jointness is the most stable although it is not widely observed.

Landscape-forming activity has intermediate features between land-preserving and recreational activities. So does the jointness.

Consequently, first it was revealed that multifunctional activities differ in cost structure and subsequently institutional jointness varies. Therefore, multifunctionality should be promoted taking into account these differences of institutional jointness derived from local conditions. Second, a community-based approach especially based on an open and extended human network rather than on the traditional closed one in rural communities will be effective for developing rural and farm diversification such as rural tourism.

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