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Ecotourism Development and Management of Common Pool Resources : A Study of Japanese Rural Communities

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Abstract

This paper is about the relationship between the development of eco-industries such as ecotourism and the community. From the theoretical perspective, we shall introduce the (Common Pool Resources) CPRs approach that enables us to treat regional resources such as the natural environment and cultural heritage as the common. Because of the properties of low-excludability and high-rivalness of CPRs, the community must manage the use of CPRs adequately. From an historical perspective, such CPRs have been managed in the rural community for a long time as indispensable resources, primarily for agriculture, forestry and fishery. It is proven by the model analysis that the management of CPRs is highly related to the cooperative behaviour of the community and to sustainable development through CPR-related industries such as tourism. Moreover, empirical research on factors that determine the management system of CPRs in Japanese rural areas will be discussed. By using the data of the 2005 Census of Agriculture and Forestry in Japan, cooperative behaviour in the community related to land use or traditional cultural events, and the structure of community-based participation, will be investigated. The plan of the paper is as follows. Section 2 explains the common pool approach of the management of CPRs for eco-industry, including ecotourism as a typical example, and mentions related studies from the theoretical as well as empirical perspectives. Section 3 develops a theoretical model to show the close relationship between the management of CPRs and eco-industry development. In section 4, the procedure for performing an empirical study of Japanese rural communities is explained; and in section 5, the major findings of the model estimates are shown. And finally, section 6 outlines the main findings and conclusions.

Key Words: Ecotourism, CPRs approach, Cooperative behavior, Community-based participation, Sustainable management

JEL Classification: R11, Q56

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1. Introduction

The tourism industry, as a typical regional eco-industry, should regard resources like the natural environment and cultural heritage as inherent factors determining the attractiveness of the tourism site. In this regard, tourism is very similar to agriculture, forestry, fishery and related industries that also need to preserve the environment adequately. Not only famous tourism sites in Japan like Kyoto and Yakushima, but less famous sites with beautiful landscapes in rural areas, also have sufficient tourism resources, replete with a historical and cultural heritage and an ecosystem. Hence, it is necessary for the stakeholders in these regions, such as residents, farmers, firms and public services, to manage these resources properly. They need to invest in a part of resource depreciation, to control the level of resource use and to incorporate economic incentives to enforce regulations. From the historical viewpoint, it is apparent that such control or management of regional resources has been thought of primarily in connection with primary industries like agriculture, forestry and fishery. These nature-based industries have developed with religious beliefs and have produced a strong cultural heritage and region-specific festivals. Accordingly, we are now in their debt.

In particular, it should be noted that regional resources like the natural environment and cultural heritage have a specific character with low excludability and high rivalry. Because everybody in the community can use these resources, they may also overuse them, leading to their over-exploitation. Resources with low excludability and high rivalry are called (Common Pool Resources) CPRs. Therefore it is very natural to conclude that CPR-related development in the region for the long term should be promoted through the proper management of CPRs. The development of primary industry or the tourism sector in the region cannot be sustainable without proper management of CPRs.

The main purpose of this paper is to prove the existence of a close relationship between regional development and the management of CPRs primarily from an eco-industry perspective. It is our hypothesis that the more cooperative the behaviour in a community, the better the regional socio-economic situation will be both from an economic and environmental perspective. It is also our task to provide empirical research regarding factors that determine the system and the situation of the management of CPRs in Japanese rural areas. The composition of the paper is as follows. Section 2 explains the common pool approach to the management of CPRs and mentions related studies from the theoretical as well as empirical perspectives. Section 3 develops a theoretical model to show the close relationship between the management of CPRs and eco-industry development.

Section 4 gives an overview of the present situation of Japanese rural areas and communities. In section 5, we explain procedures for how to conduct an empirical study of Japanese rural communities. In addition, their cooperative structure is explained and the major findings of the model estimates are shown. And finally, section 6 outlines the main findings and conclusions.

2. Common Pool Approach and Eco-industry

2.1 Development of Ecotourism Policy in Japan

As we have already mentioned, there must be a co-development relationship between the preservation of CPRs as regional resources and the growth of the eco-industry. Hereafter, we shall focus our research on ecotourism development as a typical eco-industry and the management of CPRs for ecotourism development in the region.

Recently sustainable tourism, or ecotourism, has become very popular. It means sustainable development of the rural areas. The tourism sector is important in leading the regional economy towards high economic growth. As far as Japan is concerned, for example, due to the huge divergence between inbound and outbound tourism, policies have focused on increasing inbound tourism to 10 million per year. In Japan, as in other countries, with the conversion of the industrial structure the migration from rural villages to cities has caused economic and social decline in rural areas. Hence it is obvious that the goal of tourism policy is both to increase the number of visitors and their spending and to redistribute income from cities to rural villages. However, it should be noted that in the late 1980s, the Japanese government had already enforced the same policies in order to promote regional tourism development. The Resort Law was established in 1987, when the bubble economy had just begun, and huge investment was poured into the region to build hardcore tourism facilities like golf courses and leisure conventions.

These resort development plans, however, have totally misled the socio-economy with regard to sustainable development. This is partly because the bubble economy collapsed at the beginning of the 1990s and most of these plans have failed due to insufficient funding, but mainly because the tourism-oriented development plans have been centrally planned irrespective of the each region's particularity. There is only one policy package of tourism development for various regions in Japan. It is also true that there were a few regions, like Yufuin or Ajimu in Oita prefecture, where local social planners advocated typical procedures to develop the local socio-economy with tourism. These are now exemplary regions of ecotourism using sustainable socio-economic development.

Their common features are financing by local banks, planning by local people, and concern for improving the welfare of residents, in addition to strong leadership in the management of CPRs. All of them have led to a kind of self-enforcing process of tourism development that is less influenced by the resort development plans mentioned above.

We don't think that centrally planned or government-led tourism policies necessarily led to poor development for the local areas. However, it can be easily shown that locally decentralized plans for tourism-oriented development like those in Yufuin or Ajimu should be of, by and for the people living in the community. Accordingly, since the CPRs are unexpendable resources vital to tourism development, the management of CPRs in the community must be given priority in order to keep socio-economic development sustainable. In this regard, it should also be noted that the Japanese government seems to be changing its policy slightly towards ecotourism. In fact, the Green Tourism Law was established in 1994 by the Ministry of Agriculture, Forestry and Fisheries in order to promote self-motivated tourism plans in the rural towns and villages. After the world-wide movement towards ecotourism development led by United Nations, and the International Year of Ecotourism in 2002, the Ecotourism Promotion Law was passed in 2008. This is the first law in Japan to give a clear role to ecotourism in preserving natural and cultural resources and to the crucial concerns of the community with regard to tourism development. Although it has just begun, there are some specific steps to the process that should be followed: First, a community council consisting of many stakeholders, such as promoters, non profit organizations (NPOs), professionals, landlords as well as local governments must be established. Second, the community council makes the ecotourism plans and is able to place restrictions on development activities to preserve the natural environment. As far as Japan is concerned, ecotourism seems to be desirable means of promoting tourism development along with environmental preservation and harmonious socio-economic progress[1].

2.2 Common Pool Approach and Ecotourism

The implication of tourism policy development for ecotourism is very clear. As shown in the core of the Ecotourism Promotion Law, it is the local people or the community that should plan and

[1] Sustainability, environmental preservation or regional developments are the key concepts for analyzing tourism development. See, for example, Tisdell and Wen (1997), Li (2004), Lim and Mcaleer (2005) and Tsaur, Lin and Lin (2006).

promote the management of tourism resources. Hence it is very natural to introduce the Common Pool Approach to the management of tourism resources (CPRs approach, in short) as a major means to ecotourism development. Ostrom (1990) and Ostrom et al. (1994) have given the foundation of CPRs approach. In the late 1990s, the close relationship between CPRs management and ecotourism development was investigated by Steins & Edwards (1999), Bosselman, Peterson & McCarthy (1999) and Briassoulis (2002), who have emphasized the need for a CPRs approach to promoting ecotourism.

The basic idea of the CPRs approach is that regional development can be attained by using CPRs like the natural environment and local cultural landmarks, which are typically characterized by their non-excludability and rivalry. For example, everybody in a region can approach and use the beautiful forest (non-excludability), but one person's use of it may be interrupted by another's (rivalry). People also tend to overexploit CPRs so as to lead to inefficient outcomes. This phenomenon is called 'the externality of CPRs' because someone's welfare can be negatively affected by another's use of CPRs. It has been shown that to tackle this issue, the following measures should be enforced: The first is to employ an adequate system of incentives, including user charge or subsidies, and the second is to introduce management systems. It should be noted that neither system can function well without suitable management of CPRs supported by people's participation and the cooperation of the community. Accordingly, in order to avoid the externality of CPRs and to promote the development of tourism in the region, it is necessary for the community to build a system for proper management of CPRs and to make adequate plans toward sustainable tourism development[2]. Establishing the boundary rules or the allocation rules of use of CPRs will lead to their sustainable use. As far as the boundary rule is concerned, for example, people should restrict the area which the stakeholders are allowed to access.

As mentioned above, the CPRs approach emphasizes the community's involvement, or community-based management of CPRs. However, because of the depopulation or decline of the rural socio-economy, it is becoming more difficult for the community to exercise proper

[2] Budowski (1976) has analyzed a contradictory relationship between tourism development and environmental preservation and has proven that there are three stages of the relationship, namely conflict, co-existence and symbiosis. More recently, Johanson and Diamanntis (2004), for example, have introduced some successful cases in Thailand and Kenya, where tourism has developed with cooperative behavior and eco-management. Fennel (2003) has good examples of this. Though they have never taken a CPRs approach, it should be noted that they have all mentioned the important role of community cooperation in tourism development.

management of CPRs. Both industrialization and urbanization have proven to increase an economic gap between cities and rural areas. Some people in rural areas are suburban commuters who have little interest in community activities to preserve CPRs. Moreover, as far as tourism development is concerned, investment from outside the community sometimes leads to poor management of CPRs because of the lack of community consciousness on the part of the investors. To promote community-based management of CPRs and tourism development, voluntary but routine participation and practices by all stakeholders in the region should be promoted.

3. The Model

3.1 Equilibrium in the Short Run

First, we shall focus our analysis on short-run equilibrium, where the stock of CPRs can be treated as a given. Using the CPRs approach, we should focus on rural areas where CPRs are used to develop tourism but managed by only a part of the community. To model eco-industry, such as ecotourism, from a CPRs approach, assume that there are two kinds of people, farmers and non-farmers. The fixed number of the total population is $\bar{n}$ and the number of farmers is n. Hence, the number of non-farmers is $\bar{n} - n$. Assume that the major industry in the rural area is CPR-related in the sense that it is closely related to CPRs management. Agriculture, forestry or tourism are CPR-related industries. From now on, we shall focus on tourism services as a typical example of CPR-related industries. Then the production function is given by

(1) $y = f(n, R),\ f_n > 0, f_{nn} < 0, f_R > 0, f_{RR} < 0, f_{Rn} = f_{nR} > 0$

where *R* implies the production factor that CPRs deliver. For example, it is easy to imagine that the forest is CPR, but *R* contains many kinds of CPR-originated products like timber, nuts and atmosphere, places for recreation and even specific landscapes. We shall introduce a typical form of (1) with a Cobb-Douglas type function,

(2) $y = n^{\alpha} R^{\beta},\ 1 > \alpha, \beta > 0$.

As for the production function, we assume diminishing returns to the scale, so that $\alpha + \beta < 1$. The profit is given by

(3) $\pi = py - wn - rR$

where *w* is the wage level, *r* is the user charge on CPRs and *p* is the price of products. Here, *w* is assumed to be a competitive level. This is because workers in the rural area must be employed until

wages reach a competitive or reserved level. As for employment, the first-order condition of profit maximization is given by

$$(4)\quad \frac{\partial y}{\partial n} = \alpha n^{\alpha-1} R^{\beta} = \frac{w}{p} \;\Rightarrow\; R = \left(\frac{w}{p}\right)^{1/\beta} \alpha^{-1/\beta} n^{(1-\alpha)/\beta}.$$

Equation (4) means the equality between the marginal product of labour and the real wage.

As far as the use of R is concerned, we have two polar cases;

$$(5\text{-}1)\quad \frac{\partial \pi}{\partial R} = p\beta n^{\alpha} R^{\beta-1} - r = 0 \;\Leftrightarrow\; \frac{\partial y}{\partial R} = \beta n^{\alpha} R^{*\beta-1} = \frac{r}{p},$$

$$(5\text{-}2)\quad \pi = p n^{\alpha} R^{\beta} - rR = 0 \;\Leftrightarrow\; \frac{y}{R} = n^{\alpha} R^{C\beta-1} = \frac{r}{p},$$

where R^* is efficient because the marginal product is equal to the marginal cost. However, R^C is not efficient. Equation (5-2) shows that the average income must be equal to the marginal cost in the equilibrium, meaning zero profit. If the average income is greater than the marginal cost, increasing the production level can yield an additional positive profit. Hence the maximum use of R tends to be R^C where $R^* < R^C$. This shows a typical case of overuse of CPRs. To avoid the externality, the community should control the use of resources towards R^*. As for the controllability of the community on CPRs, we shall introduce an index θ to show the effectiveness of CPR management. Then the controlled level of resource use will be

$$(6)\quad R = \theta R^* + (1-\theta) R^C = [\theta\beta^{1/(1-\beta)} + (1-\theta)] \left(\frac{p}{r}\right)^{1/(1-\beta)} n^{\alpha/(1-\beta)}.$$

In (6), if there is no control by the community, then θ = 0 and $R = R^C$. The complete control to efficient use of CPRs can be attained when θ=1 and $R = R^*$. Hence it is natural to interpret the meaning of θ as the index of the community's cooperativeness in maintaining the regional resources. Then we shall define this as

$$(7)\quad C \equiv \theta\beta^{1/(1-\beta)} + (1-\theta) = C(\theta),\ C' < 0,\ C(1) = \beta^{1/(1-\beta)} \le C \le C(0) = 1.$$

Taking (4), (6) and (7) into consideration, we have

$$(8)\quad n = [C(\theta)^{\beta(1-\beta)} p \left(\frac{1}{r}\right)^{\beta} \left(\frac{\alpha}{w}\right)^{(1-\beta)}]^{1/(1-\alpha-\beta)}.$$

Substituting (8) to (6) leads to

(9) $R = [C(\theta)^{(1-\alpha)(1-\beta)} p \left(\frac{1}{r}\right)^{(1-\alpha)} \left(\frac{\alpha}{w}\right)^{\alpha}]^{1/(1-\alpha-\beta)}$.

Similarly together (3), (8) and (9) lead to

(10) $y = [C(\theta)^{\beta(1-\beta)} p^{(\alpha+\beta)} \left(\frac{1}{r}\right)^{\beta} \left(\frac{\alpha}{w}\right)^{\alpha}]^{1/(1-\alpha-\beta)}$.

Equation (9) is the ordinary supply function with an upwards slope.

In connection with this, we shall assume the demand for the tourism service (*d*) given by

(11) $d = d(p, E) = \mu p^{-\gamma} E^{\delta},\ \mu, \gamma, \delta > 0, d_p < 0, d_E > 0$.

In equation (11), *E* is the stock of CPRs and is assumed to be constant in the short run. As for tourism, the price elasticity γ can be small enough if the region is very famous and has characteristics with respect to tourism resources, as do the world heritage sites. But, it may be large if there are few outstanding tourism sites in the region because an increase in price can lead to sharp decline of visitors. Hence, the tourism site with small γ has some monopolistic power over pricing, but the tourism site with large γ doesn't. If the tourism market is very competitive, then price elasticity will be indefinite and *p* becomes a parameter. The demand shift parameter μ is assumed to indicate a positive effort on the part of the community to raise tourism. Accordingly, it should be also recognized that a strong effort and cooperative action by a tourism-related agency in community will lead to tourism development. Therefore it is natural to refer to μ as the community's cooperativeness index for tourism development.

Equilibrium in the tourism market can be attained by the balance of (10) and (11). Then the equilibrium price in the short run will be

(12) $p = [C(\theta)^{-\beta(1-\beta)} r^{\beta} \left(\frac{w}{\alpha}\right)^{\alpha} E^{\delta(1-\alpha-\beta)} \mu^{(1-\alpha-\beta)}]^{1/A},\ A \equiv \gamma(1-\alpha-\beta) + (\alpha+\beta) > 0$.

By substituting (12) into (8), (9) and (10) respectively, we have the following in logarithmic terms;

(13) $A \log n = \beta(1-\beta)(\gamma-1) \log C(\theta) + \beta(1-\gamma) \log r + (\gamma(\beta-1) - \beta) \log\left(\frac{w}{\alpha}\right) + \delta \log E + \log \mu$

(14) $A \log R = (\gamma(1-\alpha) + \alpha)\{\log C(\theta) - \log r\} + \alpha(1-\gamma) \log\left(\frac{w}{\alpha}\right) + \delta \log E + \log \mu$

(15) $A \log y = (\gamma(1-\alpha\beta) + \alpha\beta) \log C(\theta) - \beta\gamma \log r - \alpha\gamma \log\left(\frac{w}{\alpha}\right) + (\alpha+\beta)(\delta \log E + \log \mu)$.

From (13)-(15), the effects of change in various parameters on employment, resource use and production can be summarized in Table 1.

Table 1 Effects of parameters in the short run

	θ		r		w		E
	$r>1$	$1>r>0$	$r>1$	$1>r>0$	$r>1$	$1>r>0$	
n	−	+	−	+	−	−	+
R	−	−	−	−	−	+	+
y	−	−	−	−	−	−	+

Some notable points should be mentioned in table 1. First, resource use can be managed well through the cooperative behaviour of the community. However, the cooperative management of CPRs can lead to less employment and production because it implies restricting resource use in the region. Hence, with resource preservation it is generally difficult to pursue compatible procedures that increase both income and employment. Second, we have an exception in the model case where the price elasticity is less than unity. Then the more cooperative the community is, the more employment there will be. This is because low price elasticity means the tourism site is famous and the tourism market can be efficient in the sense that cooperative management also leads to less resource use. Third, as for the user charge for CPRs, the same effects as the cooperativeness of community can be observed. An increase in user charges leads to a decrease in employment or production but less resource use. However, as far as famous tourism sites with low price elasticity are concerned, an increase in user charges will entail an increase in employment. Lastly, as for the stock level of CPRs, those CPRs that are abundant in natural environmental features as well as cultural atmosphere can lead to an increase in employment and production, and can also afford to provide more resource use.

3.2 Sustainability of Tourism Development

All tourism activities deplete an aspect of tourism resources, such as the natural environment or the cultural heritage. The major part of the depletion comes from resource use. Accordingly, it is very likely that these resources will be exhausted if there is no appropriate process for making them sustainable. Using a concept of weak sustainability, it is assumed that a part of the depletion of CPRs

can be renewed by investment. The proper maintenance of a cultural heritage, for example, can be done at a cost to the community. Even natural resources like forests or riverside landscapes can be preserved through human costs such as rule building, monitoring and planning in the community. Hence we shall assume

(16) $dE/dt = \dot{E} = H(E,\theta) - \rho E - \kappa R,\ \rho > 0, \kappa > 1$

where t is the time, ρ is the depletion rate and H is the rebirth function of CPRs with $H_E > 0$ and $H_\theta > 0$. The sustainability of the community must imply the stability condition of (16), that is $\partial \dot{E} / \partial E = H_E - \rho < 0$. This is required for the community because if it is not the case, the stock of CPRs could diverge from equilibrium and become exhausted in the long run. In (16), the financial or human burden for preserving CPRs is assumed to be related to the cooperative activities of the community. Moreover, the effect of congestion on CPRs that occurs in typical tourism sites can be indicated by κ. The greater the congestion, the more the community must increase the CPR's use to provide a sufficient tourism service. This will lead to a decrease in the stock of CPRs. A lack of cooperative activity and congestion in the CPRs can lead to a serious decline of the renewability of the CPRs. Hence a community with well-managed and completely preserved CPRs may have

(17) $R^S = [H(E,\theta) - \rho E]/\kappa \equiv R^S(E,\theta,\rho,\kappa),\ R^S{}_\theta > 0, R^S{}_\rho < 0, R^S{}_\kappa < 0$,

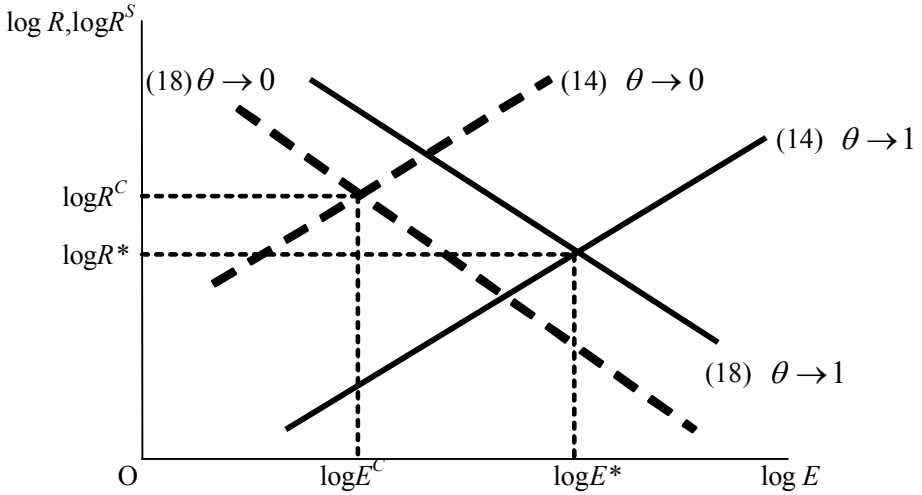
where R^S means the sustainable use of CPRs and $R^S{}_E < 0$ from the stability condition of (16). This shows the conditions for sustainable use of CPRs. Among the equations (13), (14), (15) and (17) for four variables, n R, y and E, we can have the reduced model of (14) and (17) only for R and E. Easy manipulation would be possible if equation (17) can be expressed in a linear formula such as

(18) $\log R^S = -\varepsilon_1 \log E + \varepsilon_2 \log \theta - \varepsilon_3 \log \rho - \varepsilon_4 \log \kappa$

where each coefficient is positive and implies elasticity with respect to each of the variables. Figure 1 shows (14) sloping upward and (18) sloping downward.

Because the cooperativeness of the community varies from place to place, there can be a wide range in equilibrium. If the community has a strong commitment to the maintenance of CPRs and the use of CPRs can be managed cooperatively, then the sustainable use of CPRs and the equilibrium stock of CPRs will be ($\log R^*$, $\log E^*$). However, if there is little cooperative action by the people, it is easy to see that CPRs and their use may be small, leading to less employment and production in the region.

Figure 1 Sustainable management of CPRs



Generally ecotourism is defined as tourism development with environmental preservation and a sound economy in the region. Although the concept of ecotourism includes many features, such as education, experience and an understanding of regional resources, the participation of the local people in management of tourism resources, the direct benefits to local people by tourism and the conservation and management of tourism resources seem to be common criteria by which ecotourism can be gauged. In the equilibrium at (log$R$*, log$E$*), (i) the sustainability of regional development, (ii) the maximization of profit, and (iii) market clearing are attained. As for the actual management of CPRs where θ is positive but less than 1, the equilibrium will be between (logR^C, logE^C) and (log$R$*, log$E$*). Moreover it reflects the cooperative method of decision making in the community for managing resource use. Accordingly, tourism development that occurs in equilibrium at (log$R$*, log$E$*) can be justified as the 'perfect' ecotourism.

Here we shall mention the community's social welfare function (SWF). The tourism sector in the region receives profit π in equation (3) but the total income or welfare of the community, W must be given by

(19) $W \equiv \pi + wn + rR = p\,y$.

Hence, we have the alternative of (19) in the logarithm formula,

$$(20)\quad A\log W = \beta(1-\beta)(\gamma-1)\log C(\theta) + \beta(1-\gamma)\log r + \alpha(1-\gamma)\log\left(\frac{w}{\alpha}\right) + \delta\log E + \log\mu .^{3}$$

A statistical view of equation (20) implies that the welfare or income of the community stemming from CPRs-related industries can be decomposed into factor prices, regional natural resources and controllability of the use of CPRs. Equation (20) has important implications in that there are two ways that the community's welfare can be affected by cooperative activities. One is a direct effect through the control of the use of CPRs. This effect is positive if and only if the tourism site has sufficiently small demand elasticity. As already mentioned, a tourist site tends to have small demand elasticity when it is famous and monopolistic. In this case, an increase in wages or user charges of CPRs can also increase welfare. Although control of the use of CPRs always puts restrictions on production, the small demand elasticity can increase total revenue from tourism via price increases. However, if the demand elasticity is greater than one, the control of the use of CPRs leads to less production and less welfare. The other way that the community's welfare can be affected is an indirect effect through an increase or improvement of CPRs. An increase in cooperativeness of the community will increase CPRs. Then, as shown in Figure 1, both a rightward shift of sustainable conditions by (18) and a downward shift of resource use by (14) occurs, and this leads CPRs to increase towards E^{*}, enhancing the attractiveness of the region for tourism. This is the reason why an indirect effect of more cooperative actions can increase the welfare of the community. As far as the total effect of cooperativeness in the community is concerned, it is notable that tourist sites with large demand elasticity would not succeed in increasing welfare through cooperative action to control CPRs. Accordingly, there is some possibility of widening divergences among regions through tourism development policy. It should be also noted that it is important for regions to have strategies for developing ecotourism, because even if they are not perfect, they not only enrich tourism resources as CPRs but also increase their marketability as tourist sites. In the model framework, these effects can be explained as an increase of δ or μ in equation (20).

These considerations may provide some critical points. First, the cooperation of the community does not always lead to an increase in welfare. Hence it is necessary for the community to build up a cooperative system for managing tourism. In particular, it must be a region with high

[3] SWF should include any other factors by which people in the community derive some feelings of happiness. This happiness might come from daily life in the rural atmosphere. Therefore such sources of happiness are hard to define. We shall mention only income-based happiness.

demand elasticity that needs more active marketing for tourism development. Second, the management of CPRs usually entails a contradictory control of resource use, and this will lead to a trade-off between sustainable resource management and economic growth. Third, as far as the market is concerned, it is important for the region to develop tourism marketing by improving its brand-image so that demand elasticity decreases. Accordingly, tourism development should be directed toward rediscovering and revaluing tourism resources in the region. In this sense, 'ecotourism' must be sustainable tourism development enforced persistently through continuous endeavours on the part of the community in managing CPRs.

4. Empirical Analysis of the Rural Community in Japan

4.1 An Overview of Agriculture in Japan

After World War II, the Japanese economy developed at a high growth rate promoted by the rapid industrialization of heavy industries like steel, shipbuilding and machinery. Since the 1970s, the industrial structure has developed toward higher value-added manufacturing such as electronic devices, automobiles and precision machinery, but the tendency toward non-agricultural production has not changed (see Figure 2). Moreover, farm households have received income not from farm but from non-farm subsidiary works (see Table 2). It is also notable that rapidly aging of the farming population and the decline in the attractiveness of farming have diminished incentives to cultivate land (see Table 3).

Figure 2 Cultivated Land under Management in Japan

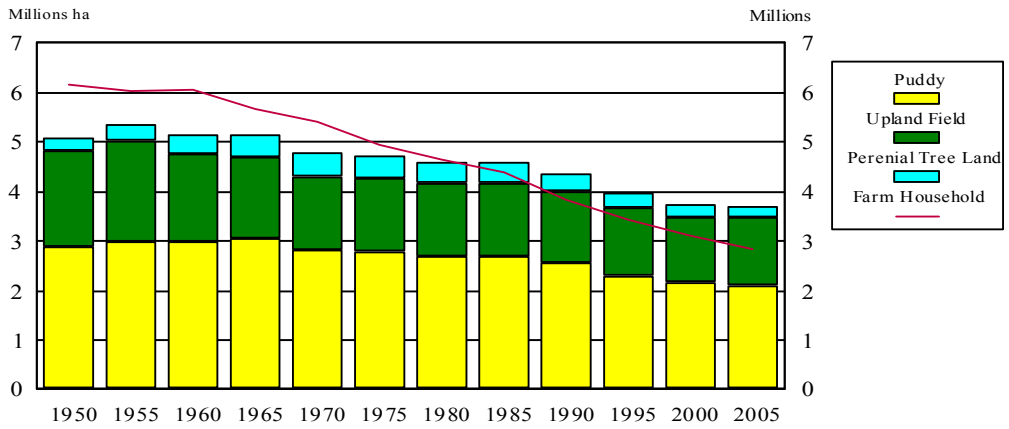


Table 2 Farm household engaged in farming

	total	major	sub-major	subsidiary
1990	2970527	820377	954339	1195811
	100.0%	27.6%	32.1%	40.3%
1995	2651403	677531	694564	1279308
	100.0%	25.6%	26.2%	48.3%
2000	2336909	500484	599449	1236976
	100.0%	21.4%	25.7%	52.9%
2005	1963424	429467	443389	1090568
	100.0%	21.9%	22.6%	55.5%

Table 3 Abandoned farm land

Year	Households	Area (ha)
1975	446036	99104
1980	427655	91746
1985	398257	92671
1990	689441	150655
1995	632768	161771
2000	845418	210019
2005	828883	385791

Source (Figure 2 & Table 2,3): Census of Agriculture and Forestry in Japan of each year.

A community in rural areas is basically supported by the rural structure of the population, production and employment and cooperative works in the community consist of community-based activities to sustain the community's resources or the socio-economy itself. Hence it is likely that the decline of primary industries has caused a drastic change and in some cases a sharp collapse of the community.

4.2 Cooperative Structure of Rural Communities in Japan

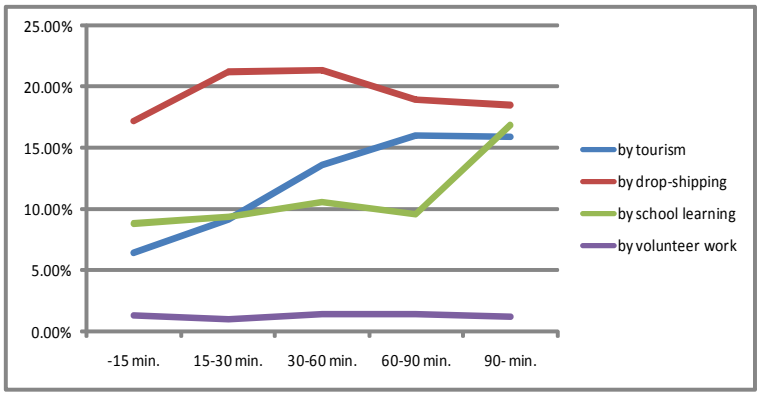
The 2005 census of agriculture and forestry in Japan[4] provides useful data related to the community structure of Japanese rural areas. Before discussing the empirical analysis, we shall explain the statistics framework of the census and give an overview of rural communities in Japan. The census has three parts: first, the inquiry into the management of agriculture and forestry (Vol. 2–Vol. 6); second, the rural district area survey, including farms and mountain villages (Vol.7); and third, the sample research on the communities (Vol. 7 and 8)[5]. Basically all but the last are censuses including all cities, towns and villages. As far as community-based research is concerned, 23,194 out of 110,897 communities are sampled and have some community functions with periodic meetings. As mentioned in the model part, our attention should be focused not only on the cooperative structure of the community but also on the relationship between cooperative actions in the

[4] The census of agriculture and forestry in Japan is designed and provided by the Ministry of Agriculture, Forestry and Fishery. This was only the census for the agricultural sector after the World Census was designated by the former FAO. Although agriculture and forestry were separately reported at first, since 1960 these two sectors have been reported jointly. See, http://www.maff.go.jp/census/2005/index.html.

[5] Vol. 1 of the census is the recapitulation and Vol. 8 includes both agricultural and forestry industries management and rural district area survey results arranged according to specification by legislation.

community and the actual development of an environmental and tourism-oriented society. Before doing an empirical examination of the community structure, we shall summarize some notable features of Japanese communities in the statistics base.

Figure 3 Interchange and distances



In Vol. 7 of the census, the rural district area study reports the use of local resources and interchange among regions, mainly between cities and rural areas. From the perspective of distance, it is notable that the interchange activities by tourism or by school learning tend to be more active in rural areas located at a greater distance from a densely inhabited district (DID). In rural areas that are more than 90 minutes from a DID, about 16% of the farm clusters are engaged in interchange activities by tourism, 6 percent-points higher than average. It also reports the relationship between an interchange activity in the rural areas and distance from DID. Four categories of community work are shown in Table 4 below: ‘direct sales of farm products’, ‘tourism’, ‘schooling’ and ‘volunteer work’. The level of volunteer work for farming is very low; only around 1% of farm clusters are engaged in it. As far as the actual number of farm clusters that eliminate overlap of each count is concerned, about 30% of farm clusters are engaged in at least one of four activities in Japan. However, these activities are not enforced under the community-level agreement. Only about 1% of the total farm clusters are engaged in these activities through agreements (see the right-hand row entitled ‘percentage’ in Table 4).

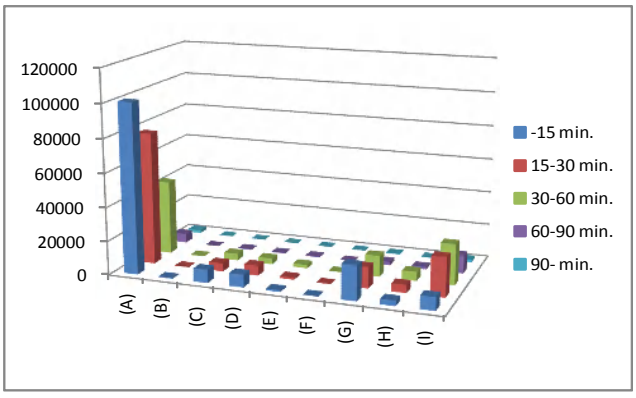
The rural district area study also reports the situation with regard to the utilization of facilities related to local resources, such as cash crops, a rental farm, parks for various forms of recreation and work-study farms or forestry. There are 15,603 farm clusters that have at least one kind of facility in

Japan, but 123,862 farm clusters do not. As for each facility, 230 million visitors come to a directly managed shop by farm located in rural areas and 135 million to forest-related facilities (E) to (I) designated below in the legend. Many visitors tend to visit places located nearer to DID but (I), including ski areas, bird-watching, field athletics and orienteering areas, etc. Figure 5 (a) and (b) shows the per-cluster and per-facility based number of visitors to each facility. It may be noteworthy that a large number of people, (around 54, 000) tend to visit a recreational facility of forest.

Table 4 Activities for interchange of farm-clusters

	Any intercourse of farm-cluster	by tourism			by drop-shipping			by school learning			by volunteer work			No intercourse of farm-cluster
		active	as community work	Inactive	active	as community work	Inactive	active	as community work	Inactive	active	as community work	Inactive	
Total	42 063	13 443	1 659	126 022	27 455	2 412	112 010	13 424	1 084	126 041	1 726	258	137 739	97 402
-15 min.	13 191	3 255	321	47 528	8 757	786	42 026	4 511	319	46 272	668	50	50 115	37 592
15-30 min.	14 369	4 235	553	42 098	9 866	837	36 467	4 343	258	41 990	472	78	45 861	31 964
30-60 min.	11 453	4 582	610	29 193	7 215	602	26 560	3 594	305	30 181	472	102	33 303	22 322
60-90 min.	2 259	1 046	128	5 489	1 239	118	5 296	631	64	5 904	89	24	6 446	4 276
90- min.	791	325	47	1 714	378	69	1 661	345	138	1 694	25	4	2 014	1 248
percentage		9.64%	1.19%	90.36%	19.69%	1.73%	80.31%	9.63%	0.78%	90.37%	1.24%	0.18%	98.76%	
-15 min.	31.36%	6.41%	0.63%	93.59%	17.24%	1.55%	82.76%	8.88%	0.63%	91.12%	1.32%	0.10%	98.68%	38.59%
15-30 min.	34.16%	9.14%	1.19%	90.86%	21.29%	1.81%	78.71%	9.37%	0.56%	90.63%	1.02%	0.17%	98.98%	32.82%
30-60 min.	27.23%	13.57%	1.81%	86.43%	21.36%	1.78%	78.64%	10.64%	0.90%	89.36%	1.40%	0.30%	98.60%	22.92%
60-90 min.	5.37%	16.01%	1.96%	83.99%	18.96%	1.81%	81.04%	9.66%	0.98%	90.34%	1.36%	0.37%	98.64%	4.39%
90- min.	1.88%	15.94%	2.31%	84.06%	18.54%	3.38%	81.46%	16.92%	6.77%	83.08%	1.23%	0.20%	98.77%	1.28%

Figure 4 Visitors and Distances from DID (1000's)



(A) local direct shop
(B) civil farm
(C) interpretive center for agriculture
(D) farm garden
(E) interpretive center for forestry
(F) work-study forestry
(G) forestry park
(H) camping
(I) other recreation site in forestry

Figure 5(a) Visitors per farm cluster

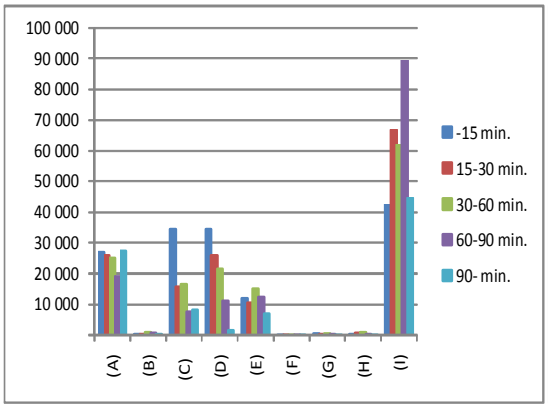
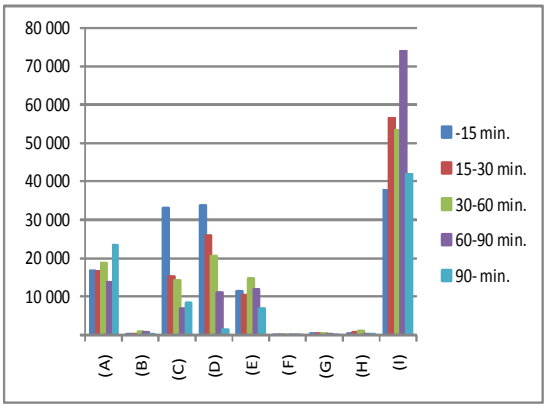


Figure 5(b) Visitors per facility



The community-based research in Vol. 7 of the census includes more detailed information about the cooperation and activity of the community.

As shown in Table 5, there are six subjects about which meetings for various community works are held. Several points should be noted. With regard to the festival, it can be found that the participation rate is very high, around 80%, and older residents tend to participate more in mid and intermontane areas. This is also true in cases of the ‘welfare of seniors’, ‘preservation of the landscape’ and ‘protection of nature’. These activities are mainly supported by older rather than younger residents. Females play an important role in the welfare of the community and tend to discuss this issue more frequently than males. However, as for the preservation of traditional culture, the participation rate of the young is relatively high. It is easy to show that participation in meetings for festivals, culture and events is decreasing, but participation in areas concerning the welfare of seniors, preservation of the landscape and the protection of nature is increasing. Hence it is likely that a community tends to be more cooperative not only with regard to the welfare of the aged but in the area of environmental preservation. In particular, in the mid and intermontane areas, environment-related cooperation in a community must be more active. As mentioned above, however, mainly older residents support these activities. Aging has occurred drastically in the rural areas of Japan and this means that we need cooperative activity by the young as well as by the outsiders of the community. Accordingly, cooperation among communities is also the key to such an aging society, and the interchange of personnel between city and rural areas, for example, is an important factor.

5 .A model estimates

Because the aim of our research is to find out how important the cooperative action of the community is for regional development, our interest should first of all be focused on cooperative behaviour and its outcome. As indicated by equation (20), which shows how CPRs and cooperative action for CPRs are important, our empirical research must include an estimate of cooperativeness in the region. Secondly, as equation (20) also implies, we shall investigate some economic variables related to production that determine the level of regional welfare or income.

5.1 Cooperativeness of community activities

As already mentioned, sample research on rural communities from the 2005 Census of Agriculture and Forestry in Japan can be useful to estimate the cooperativeness of the rural community. Among the data, that which concerns both 'the participation rate of community activities' and 'community-based meetings' are of importance. Both are prefectural-based data as shown in Table 6, and we can employ some statistical procedures that show some characteristics of the structure of cooperativeness in the region.

The participation rate of community activity is defined as the ratio of communities where a meeting for each activity is held to the total number of communities. They can be classified into two categories: one consists of meetings for activities of farm production, farm roads and water management, and management of commons; and the other consists of meetings for non-farm activities, including management of facilities for daily-life, community events and environmental preservation. For example, in the first cell of Table 6, we can see that meetings for farm production are held in 78% of the communities in Hokkaido. On the other hand, community-based meetings include festival or event-oriented meetings, cultural and environmental preservation, and welfare for seniors. The figures for the community-based meetings in Table 6 also indicate the same participation rate as the community activities. Hence it is notable that meetings for festival are held in 72% of the communities in Hokkaido but these for preservation of landscapes are held only in 56% of the communities in Hokkaido[6].

[6] As for community-based meetings, we have made some revisions to the original data to incorporate the frequency of the meetings and to eliminate participation of the outsiders. By using data on the frequency of meetings per year and the rate of participation of outsiders, we get the data shown in Table 6. However, it is notable that this technical amendment does not lead to substantial difference.

Table 5 Community, Cooperation and Meeting by area, by age, by frequency

Purpose of meeting	Farming area	community with any meeting	participant rate	change between 1995-2005	participation												frequency					
					age-class mailly promoting								region									
					young		female		elder		other		within community only		includes outside		once or more per month		once or more per 6 months		once or more per year	
Festival	Total	86420	77.9%	Δ 1860	8580	9.9%	390	0.5%	11010	12.7%	66450	76.9%	60960	70.5%	25460	29.5%	670	0.8%	25000	28.9%	60750	70.3%
	Urban area	15790	77.0%	Δ 230	1670	10.6%	90	0.6%	1780	11.3%	12260	77.6%	11260	71.3%	4540	28.8%	140	0.9%	4010	25.4%	11650	73.8%
	flat area	25130	77.9%	Δ 810	3040	12.1%	130	0.5%	2850	11.3%	19100	76.0%	18420	73.3%	6700	26.7%	160	0.6%	7430	29.6%	17550	69.8%
	mid area	28960	76.8%	Δ 500	2770	9.6%	110	0.4%	3760	13.0%	22330	77.1%	19540	67.5%	9430	32.6%	300	1.0%	8240	28.5%	20430	70.5%
	intermontane area	16530	81.0%	Δ 320	1100	6.7%	70	0.4%	2610	15.8%	12760	77.2%	11740	71.0%	4790	29.0%	70	0.4%	5330	32.2%	11130	67.3%
Preservation of traditional culture	Total	32150	29.0%	Δ 1820	6510	20.2%	670	2.1%	4320	13.4%	20650	64.2%	21370	66.5%	10780	33.5%	1640	5.1%	7950	24.7%	22560	70.2%
	Urban area	5690	27.8%	Δ 230	1150	20.2%	100	1.8%	820	14.4%	3620	63.6%	4080	71.7%	1620	28.5%	300	5.3%	1340	23.6%	4050	71.2%
	flat area	9340	28.9%	Δ 500	2160	23.1%	210	2.2%	1310	14.0%	5660	60.6%	6700	71.7%	2640	28.3%	390	4.2%	2410	25.8%	6540	70.0%
	mid area	11020	29.2%	Δ 610	2100	19.1%	230	2.1%	1370	12.4%	7320	66.4%	6910	62.7%	4110	37.3%	660	6.0%	2720	24.7%	7650	69.4%
	intermontane area	6110	29.9%	Δ 470	1110	18.2%	130	2.1%	820	13.4%	4040	66.1%	3690	60.4%	2420	39.6%	310	5.1%	1480	24.2%	4320	70.7%
Events	Total	54540	49.2%	Δ 1240	5320	9.8%	1250	2.3%	4140	7.6%	43820	80.3%	33860	62.1%	20690	37.9%	1150	2.1%	13750	25.2%	39630	72.7%
	Urban area	10140	49.4%	Δ 290	820	8.1%	300	3.0%	820	8.1%	8200	80.9%	6720	66.3%	3410	33.6%	200	2.0%	2550	25.1%	7390	72.9%
	flat area	15910	49.3%	Δ 270	1850	11.6%	390	2.5%	1030	6.5%	12630	79.4%	10570	66.4%	5340	33.6%	270	1.7%	3940	24.8%	11710	73.6%
	mid area	18960	50.3%	Δ 460	1850	9.8%	330	1.7%	1390	7.3%	15390	81.2%	11340	59.8%	7630	40.2%	490	2.6%	5100	26.9%	13380	70.6%
	intermontane area	9530	46.7%	Δ 240	800	8.4%	230	2.4%	890	9.3%	7600	79.7%	5220	54.8%	4310	45.2%	200	2.1%	2170	22.8%	7150	75.0%
Welfare for senior	Total	38690	34.9%	3460	610	1.6%	8680	22.4%	11360	29.4%	18040	46.6%	28140	72.7%	10550	27.3%	5570	14.4%	11680	30.2%	21440	55.4%
	Urban area	6990	34.1%	560	150	2.1%	1350	19.3%	2090	29.9%	3410	48.8%	5500	78.7%	1500	21.5%	970	13.9%	2290	32.8%	3740	53.5%
	flat area	11780	36.5%	1350	230	2.0%	2440	20.7%	3740	31.7%	5370	45.6%	9140	77.6%	2640	22.4%	1710	14.5%	3660	31.1%	6420	54.5%
	mid area	13370	35.5%	1050	170	1.3%	3140	23.5%	3780	28.3%	6270	46.9%	9140	68.4%	4230	31.6%	1880	14.1%	3870	28.9%	7620	57.0%
	intermontane area	6550	32.1%	500	60	0.9%	1750	26.7%	1740	26.6%	2990	45.6%	4370	66.7%	2190	33.4%	1020	15.6%	1860	28.4%	3660	55.9%
Preservation of landscape	Total	64450	58.1%	4380	1980	3.1%	3280	5.1%	11210	17.4%	47990	74.5%	52870	82.0%	11590	18.0%	3640	5.6%	28870	44.8%	31930	49.5%
	Urban area	10070	49.1%	480	300	3.0%	390	3.9%	1720	17.1%	7660	76.1%	8360	83.0%	1710	17.0%	840	8.3%	4440	44.1%	4790	47.6%
	flat area	18610	57.7%	1050	770	4.1%	1050	5.6%	3270	17.6%	13530	72.7%	15560	83.6%	3050	16.4%	1080	5.8%	8700	46.7%	8830	47.4%
	mid area	22880	60.7%	1900	590	2.6%	1050	4.6%	3820	16.7%	17430	76.2%	18410	80.5%	4480	19.6%	1070	4.7%	10410	45.5%	11410	49.9%
	intermontane area	12880	63.1%	940	320	2.5%	780	6.1%	2400	18.6%	9370	72.7%	10540	81.8%	2350	18.2%	650	5.0%	5310	41.2%	6910	53.6%
Protection of nature, animals and plants	Total	7390	6.7%	960	490	6.6%	130	1.8%	1310	17.7%	5450	73.7%	5280	71.4%	2100	28.4%	340	4.6%	2950	39.9%	4100	55.5%
	Urban area	1140	5.6%	140	90	7.9%	30	2.6%	200	17.5%	820	71.9%	930	81.6%	210	18.4%	70	6.1%	460	40.4%	620	54.4%
	flat area	1880	5.8%	240	140	7.4%	40	2.1%	400	21.3%	1290	68.6%	1380	73.4%	500	26.6%	90	4.8%	810	43.1%	970	51.6%
	mid area	2690	7.1%	410	200	7.4%	40	1.5%	460	17.1%	2000	74.3%	1870	69.5%	830	30.9%	90	3.3%	1020	37.9%	1580	58.7%
	intermontane area	1680	8.2%	170	70	4.2%	20	1.2%	250	14.9%	1340	79.8%	1120	66.7%	570	33.9%	90	5.4%	660	39.3%	930	55.4%

Because meetings about the welfare of seniors in the local community depend on national as well as local policies, they cannot be only the result of voluntary or autonomous activity by the community. Hence we attain four major series of data concerning community-based cooperative activities except for senior welfare: activities for farm production, non-farm activities, festival and event-oriented activities and activities for cultural and environmental preservation. They are composed by ordinal procedure of the principal component analysis as shown in Table 6.

Table 6 Cooperative activities in the community and the cooperativeness index

	Participation rate of community activity						Community-based meetings						Score of Principal Components				Cooperative-ness Index
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(8),(11),(12)	(7),(9)	(4),(5),(6)	(1),(2),(3)	
	on farm production	on management of greenway,drainage and reservoir	on management of commons for farm production	on management of facilities for daily-life	on plans and hosts of community events	on enverionmental preservation and landscape management	Festival	preservation of traditional culture	events	welfare for senior	preservation of landscape	protection of natural animals and plants	Culture and Nature	Festival & Event	non-Farming	Farming	
Hokkaido	0.78	0.64	0.33	0.79	0.87	0.71	1.04	0.15	0.65	0.65	1.13	0.04	-1.59	-1.52	0.04	-0.21	-1.16
Aomori	0.49	0.62	0.25	0.74	0.82	0.71	0.94	0.70	0.51	0.80	1.11	0.06	0.35	-0.27	-0.37	-1.09	-0.43
Iwate	0.81	0.70	0.24	0.74	0.87	0.79	0.82	1.30	0.98	1.00	1.58	0.12	1.21	-0.83	0.20	-0.19	0.14
Miyagi	0.91	0.86	0.23	0.88	0.94	0.90	0.88	0.55	0.91	1.72	1.50	0.08	-0.34	-0.57	1.34	0.49	0.23
Akita	0.85	0.84	0.47	0.87	0.93	0.77	0.97	0.50	0.75	0.71	1.03	0.09	-0.20	0.23	0.81	1.02	0.57
Yamagata	0.89	0.89	0.42	0.90	0.94	0.84	1.08	0.59	1.09	1.91	1.60	0.17	0.63	0.71	1.18	1.12	1.18
Fukushima	0.84	0.86	0.32	0.80	0.90	0.87	0.98	0.47	0.73	0.74	1.37	0.09	-0.11	-0.27	0.85	0.63	0.31
Ibaragi	0.63	0.65	0.18	0.59	0.80	0.58	0.93	0.56	0.33	0.53	0.70	0.02	-0.85	-0.78	-1.34	-0.89	-1.25
Tochigi	0.74	0.55	0.09	0.54	0.82	0.59	1.02	0.43	0.31	0.23	0.84	0.04	-0.99	-1.14	-1.35	-1.29	-1.56
Gunma	0.62	0.70	0.25	0.71	0.90	0.81	1.11	0.71	0.68	0.77	1.50	0.10	0.48	0.07	0.36	-0.55	0.12
Saitama	0.58	0.58	0.10	0.60	0.81	0.59	1.04	0.36	0.43	0.57	0.79	0.07	-0.89	-0.82	-1.23	-1.50	-1.45
Chiba	0.45	0.72	0.17	0.65	0.80	0.65	0.82	0.44	0.22	0.28	0.84	0.05	-0.74	-1.40	-0.95	-1.07	-1.38
Tokyo	0.67	0.33	0.00	0.00	1.00	0.33	1.00	0.67	1.33	0.00	0.00	0.00	-0.82	0.91	-2.83	-2.41	-1.58
Kanagawa	0.41	0.69	0.20	0.76	0.94	0.80	1.06	1.14	1.31	1.22	1.45	0.06	1.07	1.06	0.61	-1.14	0.56
Niigata	0.86	0.82	0.36	0.60	0.86	0.54	1.23	0.50	0.86	1.00	0.58	0.23	-0.06	1.23	-1.17	0.64	0.28
Toyama	0.90	0.91	0.37	0.85	0.91	0.82	1.50	0.64	0.96	1.33	1.09	0.23	0.51	1.77	0.81	1.05	1.38
Ishikawa	0.89	0.89	0.38	0.83	0.95	0.83	1.61	0.52	0.66	1.15	1.22	0.21	0.93	2.00	0.96	1.03	1.64
Fukui	0.90	0.87	0.40	0.87	0.93	0.87	1.53	0.41	0.75	0.78	1.49	0.03	0.04	2.08	1.12	1.01	1.40
Yamanashi	0.54	0.83	0.31	0.88	0.98	0.91	0.95	0.44	0.68	0.75	0.87	0.05	-0.85	-0.12	1.56	-0.11	0.06
Nagano	0.68	0.81	0.44	0.81	0.91	0.79	1.27	1.12	1.04	1.44	1.71	0.33	2.50	1.09	0.55	0.51	1.61
Gifu	0.79	0.71	0.27	0.74	0.90	0.77	1.22	0.47	0.84	0.94	1.40	0.14	-0.01	-0.15	0.24	-0.12	-0.03
Shizuoka	0.50	0.69	0.23	0.79	0.91	0.79	0.99	0.61	0.68	0.84	1.57	0.28	1.83	0.57	0.51	-0.90	0.71
Aichi	0.89	0.84	0.27	0.73	0.82	0.76	1.14	0.63	0.74	0.92	0.72	0.19	-0.30	-0.23	-0.20	0.50	-0.08
Mie	0.74	0.87	0.37	0.77	0.92	0.82	1.30	0.59	0.81	1.44	1.03	0.28	0.69	0.59	0.63	0.60	0.83
Shiga	0.94	0.81	0.58	0.72	0.89	0.72	1.36	0.81	1.27	2.40	1.56	0.43	3.16	2.41	-0.03	1.43	2.43
Kyoto	0.88	0.85	0.55	0.64	0.85	0.61	1.02	0.57	0.99	1.05	0.91	0.17	0.47	0.53	-0.85	1.33	0.54
Osaka	0.58	0.75	0.40	0.46	0.66	0.49	1.21	0.24	0.81	1.58	0.75	0.15	-0.75	0.26	-2.74	-0.03	-0.98
Hyogo	0.87	0.78	0.48	0.73	0.88	0.70	1.11	0.45	0.92	1.46	1.48	0.15	0.47	0.79	-0.08	0.89	0.71
Nara	0.63	0.72	0.40	0.62	0.85	0.63	1.10	0.30	0.72	1.06	0.98	0.18	-0.23	0.39	-0.83	-0.05	-0.20
Wakayama	0.50	0.89	0.36	0.75	0.88	0.74	0.94	0.66	0.62	1.12	0.88	0.07	-0.89	-1.20	0.13	0.18	-0.64
Tottori	0.94	0.89	0.62	0.86	0.94	0.78	0.99	0.39	0.70	1.09	1.61	0.05	0.15	0.43	0.86	1.82	1.05
Shimane	0.83	0.78	0.30	0.86	0.94	0.85	1.11	0.66	0.81	0.95	1.17	0.03	-0.96	-1.02	1.07	0.27	-0.31
Okayama	0.50	0.72	0.29	0.69	0.81	0.75	1.13	0.31	0.67	0.77	1.26	0.12	-0.70	-0.39	-0.36	-0.60	-0.69
Hiroshima	0.72	0.77	0.30	0.83	0.94	0.86	0.79	0.36	0.78	0.63	0.83	0.14	-1.27	-1.43	1.07	0.02	-0.64
Yamaguchi	0.78	0.64	0.28	0.62	0.86	0.66	1.06	0.34	0.37	1.36	0.85	0.10	-1.27	-1.22	-0.67	-0.32	-1.18
Tokushima	0.49	0.76	0.16	0.56	0.77	0.60	0.85	0.30	0.13	0.25	0.73	0.04	-1.15	-1.59	-1.49	-0.87	-1.68
Kagawa	0.84	0.73	0.13	0.59	0.84	0.62	0.89	0.56	0.51	0.97	0.96	0.03	-0.86	-1.30	-0.99	-0.37	-1.17
Ehime	0.69	0.84	0.37	0.77	0.87	0.73	0.80	0.48	0.64	0.94	1.21	0.20	-0.03	-1.08	0.03	0.40	-0.25
Kochi	0.26	0.65	0.17	0.59	0.87	0.61	1.26	0.19	0.33	0.96	0.73	0.01	-1.57	-0.39	-0.87	-1.68	-1.50
Fukuoka	0.90	0.87	0.36	0.81	0.88	0.79	1.27	0.48	0.76	1.36	1.96	0.09	0.60	0.69	0.42	0.90	0.87
Saga	0.98	0.91	0.66	0.82	0.95	0.84	1.22	0.46	0.59	0.50	1.70	0.12	0.51	0.33	0.99	2.08	1.26
Nagasaki	0.78	0.71	0.26	0.69	0.87	0.82	1.13	0.47	0.63	0.65	1.17	0.14	-0.21	-0.46	0.18	-0.17	-0.24
Kumamoto	0.73	0.81	0.33	0.69	0.88	0.76	1.21	0.56	0.91	1.43	1.43	0.15	0.39	0.60	0.02	0.30	0.45
Oita	0.78	0.79	0.38	0.78	0.92	0.69	1.40	0.64	0.72	1.17	1.31	0.14	-0.21	0.16	0.17	0.43	0.17
Miyazaki	0.80	0.81	0.25	0.75	0.92	0.83	0.93	0.75	0.74	1.10	1.26	0.17	0.42	-0.43	0.64	0.19	0.25
Kagoshima	0.45	0.60	0.15	0.62	0.91	0.79	0.71	0.38	1.09	1.20	1.50	0.13	-0.02	-0.54	0.06	-1.50	-0.67
Okinawa	0.41	0.52	0.19	0.78	0.93	0.89	0.81	0.81	0.85	3.26	2.07	0.11	1.45	0.25	0.94	-1.78	0.30

The column to the extreme right in table 6 shows the over-all cooperativeness of community-based activity derived from the four principle components mentioned above. To look at these indices from a heuristic viewpoint, we shall apply a cluster analysis and give an outcome as shown in Figure 6. This procedure leads us to a clear understanding of the classification of prefectures. This is shown in Table 7.

Figure 6　cooperativeness index of the community

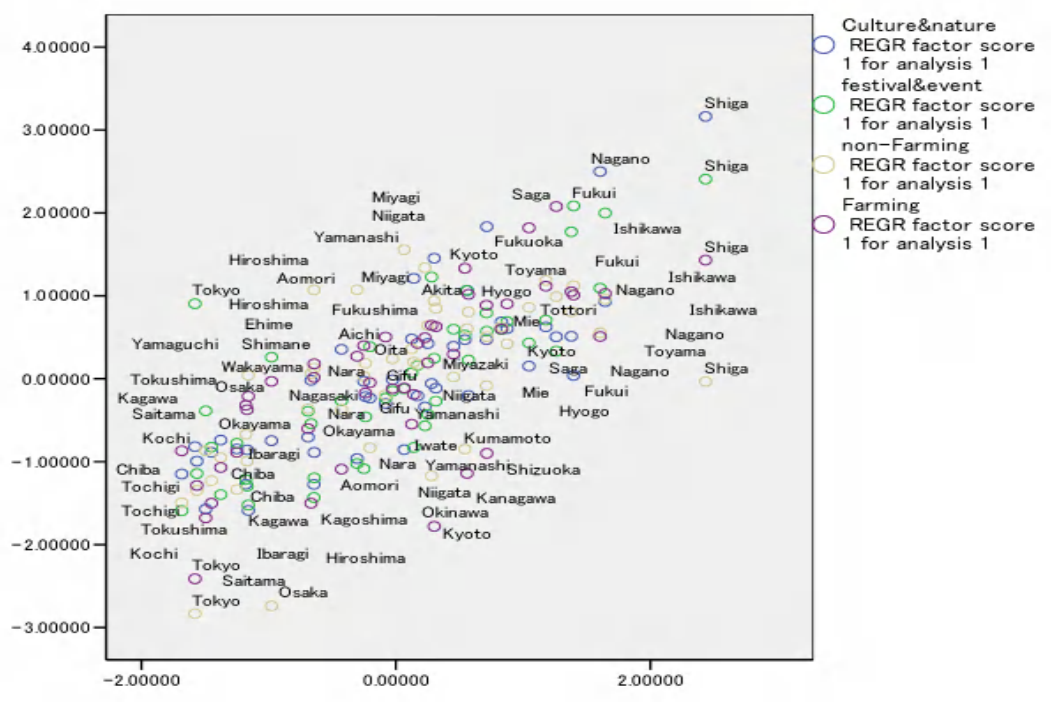


Table 7 Classification of prefectures by community cooperativeness

Cluster	prefecturfes	Culture and Nature	Festival and Event	non-Farming	Farming
1	Gifu,Nagasaki,Miyazaki,Gunma Aichi,Oita,Ehime,Iwate,Aomori, Kagoshima,Niigata,Nara,Kyoto	0.14	-0.12	-0.12	-0.01
2	Shimane,Hiroshima,Hokkaido, Wakayama,Miyagi,Fukushima, Akita,Yamanashi	-0.78	-0.74	0.86	0.29
3	Yamaguchi,Kagawa,Okayama, Tochigi,Saitama,Ibaragi, Chiba,Tokushima,Kochi,Tokyo,Osaka	-0.96	-0.71	-1.35	-1.00
4	Toyama,Ishikawa,Fukui,Mie, Fukuoka,Hyogo,Kumamoto, Tottori,Saga,Yamagata	0.49	1.00	0.69	1.08
5	Kanagawa,Shizuoka,Okinawa, Nagano,Shiga	2.00	1.08	0.52	-0.38

As far as the four indices are concerned, the communities in each prefecture can be classified by some distinguishable feature. In prefectures of cluster No. 5, such as Okinawa, Nagano and Shiga, communities must be very active to preserve their natural and cultural environments and to hold festivals and events. Nagano and Shiga especially include a high degree of cooperativeness among local communities; the factors contributing to such large cooperativeness come mainly from high participation in preserving the cultural and natural environment. Communities in prefectures of cluster No. 3, such as Chiba, Tokyo and Osaka, seem to behave inactively for every cooperative activity, especially those related to non-farming and farming. In addition, for those in cluster No 4, such as Toyama, Ishikawa and Mie, community activities for farming and its related works are cooperative. As shown in Figure 6, the community's cooperativeness varies greatly from region to region and the factors that lead to those differences are also very diverse.

5.2 Community and the Structure of Cooperativeness

The next step is to observe how the cooperativeness of various community–based activities is related to their outcome. Here we shall focus our attention on the effect of a community's cooperative behaviour on both farming and related outcomes, including tourism, and on the income-based welfare of the region. We shall prove the former by utilizing the data of the census. As far as the latter is concerned, we shall incorporate some macro data such as income, capital costs and wages from the prefectural base to estimate equation (20).

5.2.1 Cooperativeness and its outcomes

Meetings and other cooperative activities are performed by communities in order for achieving certain aims. People in a community usually gather for managing and ensuring that traditional festivals, for general work and for preserving their environment. Many visitors enjoy traditional festivals or tourist sites, special landscapes and good harvests from farmland.

We have already proven that there are four principle factors that can be integrated into a cooperativeness index, as indicated in Table 6. As for the outcomes derived from the cooperative behaviour, we shall feature some data from the rural district area survey in Vol. 7 of the 2005 census. The data-tables are 'situations of the use of local resources' that include various activities like tourism, drop-shopping, school-learning and volunteer work for interchange between farm-clusters

and urban areas and 'farm-related activities' that include farmers' management of processing and providing farm products and tourism-related management of farms, restaurants and guest houses. We also employ data concerning eco-friendly activities of farm clusters that can be effective under cooperative circumstances in the community. The summary table of the data is shown in Table 8.

A suitable procedure to look for model specification is covariance structure analysis. We have applied this method in order to have a robust estimate and mainly tried two types of model frameworks; one is the causal relationship model between unobserved variables, and the other is a type of (Multiple Indicator Multiple Cause) MIMIC model in which an unobserved variable is determined by some observed variables and other observed variables are fixed by that unobserved variable. A sample of the former procedure is given as Figure 7. Although we have tried many prototypes of the model, it is hard to find a plausible pattern of correlation that indicates the relationship between 'cooperativeness (cooperation 1 in Figure 7)' and 'socio-economic condition (Community in Figure 7)' of the community. In fact, as shown in Figure 7, they have negative signs that would contradict both what the theoretical view tells us and what we expected empirically. To eliminate these contradictory outcomes, we have tried another type of model named the MIMIC model. A sample result of the MIMIC model is given in Figure 8. We have already had four principal components, 'culture and nature', 'festival and event', 'non-farming' and 'farming', and their integrated index that shows the community's cooperativeness. They can be treated as observed variables and we can recursively analyze the MIMIC model. A trial-and error method will take us to a final version of the model given as Figure 8[7].

Some points in Figure 8 are notable. First, an unobserved variable named 'community' is calculated in order to indicate a community's cooperativeness and this is determined mainly by 'festival & event' or 'culture & nature' factors rather than an 'overall' factor. Second, this leads to positive effects on 'visitors', 'farm products', 'farm environment' and 'per capita income'. Hence, it

[7] As for the covariance structural analysis, both cases are regressed by ML estimates. From a technical viewpoint, many test statistics are reported to have a robustness of estimates. For the MIMIC model, all the estimators are significant at the 1% level except for 'Culture & Nature' to 'community' (the probability is 0.42) and 'community' to 'tourism' (0.166). As far as the examples are concerned, we have the following results.

model	Examination by $\chi 2$			GFI	AGFI	CFI	RMSEA	AIC	BIC
	$\chi 2$	d.f.	Prob.						
A	45.32	34	0.093	0.803	0.681	0.61	0.085	87.32	100.52
B	57.53	29	0.001	0.821	0.661	0.961	0.146	109.53	125.88

It should be noted that some statistics reported in this table are not as good as the criterion of statistics. Especially, RMSEA (root mean square error of approximation) is reported to be less than one for a favorable model.

is natural to reach the conclusion that daily or routine meetings for various purposes held in the community will create an atmosphere for cooperative actions and will also lead to a community full of vitality. In such active communities the interchange of products and people between rural and urban areas is developing through tourism or farm-related marketing, leading to the affluence of the community.

Figure 7　Causal relationship model (A)

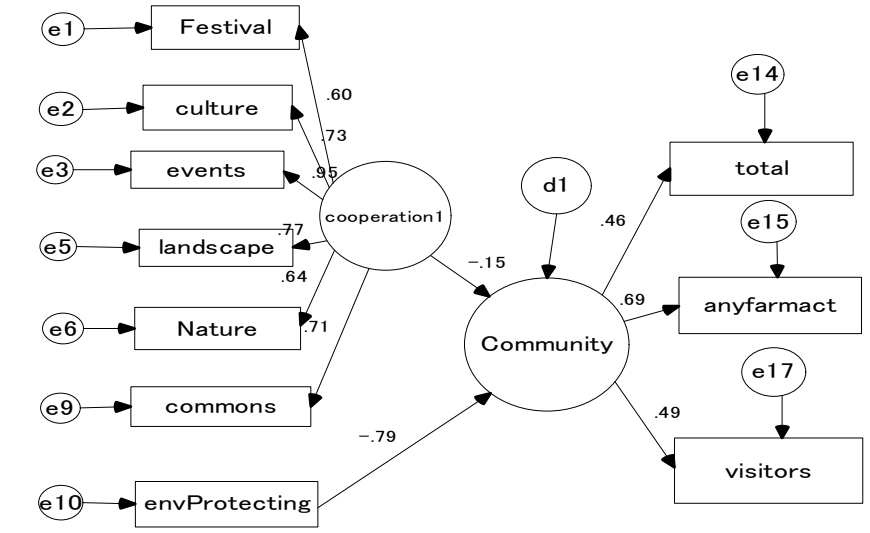
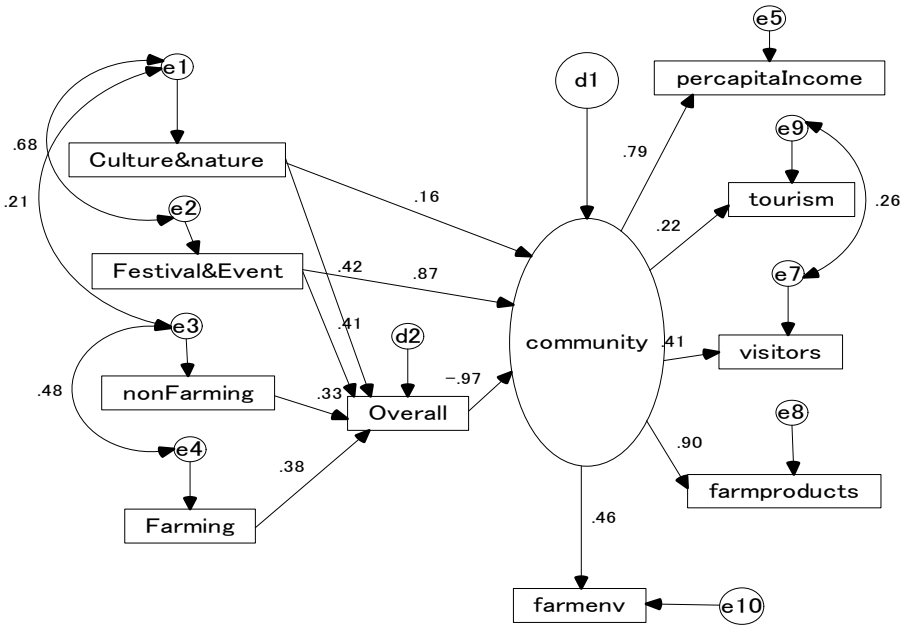


Figure 8 MIMIC model (B)



5.2.2 Cooperativeness and welfare of the community

Our final task is to confirm the relationship between cooperative actions for managing CPRs and their outcomes for the community. To put it concretely, we shall investigate how cooperativeness affects the level of welfare in the community given as in equation (20). Before estimating the model equation, we have to mention the data structure for equation (20). This is summarized in Table 8.

Table 8 Data and sources

Variables	Contents	Sources
$W(py)$	Welfare(nominal prefectural income) : W=Gross prefectural products of primary sector and service industry	Social indicators by prefecture 2008, Statistics Bureau, Ministry of Internal Affair and Communications
θ	Community's cooperativeness	See Table 6.
r	User charge of CPRs: r_1=investment expenditure of local government / $CPRs_1$, r_2=investment expenditure of local government / $CPRs_2$	Social indicators by prefecture 2008, Statistics Bureau, Ministry of Internal Affair and Communications
w	Competitive wages: w= minimum wage in prefectural base	Ministry of Health, Labor and Welfare
E	Common pool resources(Stock): $CPRs_1$=total land area, $CPRs_2$=total land area minus inhabitable area	Social indicators by prefecture 2008, Statistics Bureau, Ministry of Internal Affair and Communications

Note: All variables are of 2005.

Among them, the data that should be defined most carefully are the stock level of CPRs and its cost. However, it may be hard to have exactly the same values as CPRs because the conception of CPRs is very theoretical and includes many aspects, such as nature, culture etc. For convenience of actual analysis, it is our assumption that the size of CPRs should mainly correspond to their land-use for forest and agriculture. Next we have to estimate a user charge for CPRs. Sometimes there is no user charge paid directly because of non-excludability. Firms can approach and use some CPRs without paying. A beautiful landscape or clean stream, for example, can be a distinctive feature for a tourist site. However maintaining them is costly, and this is usually financed through taxes. To have a user-charge for CPRs, we shall assume that investment expenditure by local governments, including public investment and expenditure against natural calamities, would be a proxy for it. Because our data is simply based on a cross-section, we shall estimate the model using the ordinary least square method. Table 9 reports the estimates and the test statistics for the model.

All parameters in Table 9 except for cooperativeness are positive and statistically significant. This means that the welfare of the community can be increased when the wage level, user-charge and/or use of CPRs grows larger. In equation (20), this is the equivalent of γ being less than one. For the model analysis, we have assumed that β must be less than one. Accordingly, it is easy to prove that cooperativeness should positively affect the welfare of the community. As far as overall cooperativeness is concerned, that is the cooperativeness index in Table 6, it is not statistically significant. We have already examined how the relationship between the four factors and their outcomes is so complicated in the MIMIC model. A possible explanation may be that a factor like 'culture & nature' can have such a positive and huge effect that cooperativeness in the community affects welfare positively. This is given by model 5 in Table 9.

Table 9 Parameter estimates of the Community model (20)

Dep.Variables(W)			model 1		model2		model2		model4		model5	
Ind.Variables				VIF		VIF		VIF		VIF		VIF
constant			-48.120 ***		-52.477 ***		-57.860 ***		-47.015 ***		-48.872 ***	
			(2.989)		(-3.231)		(-3.890)		(-2.770)		(3.117)	
Coopertiveness	θ	Overall	-0.148	1.1								
			(-1.324)									
		Culture&nature			0.405 ***	2.2	0.401 ***	2.1	0.445 ***	2.2	0.446 ***	2.1
					(2.752)		(2.838)		(2.979)		(3.142)	
		Festival&event			-0.438 ***	2.7	-0.503 ***	2.2	-0.519 ***	2.6	-0.549 ***	2.1
					(-2.699)		(-3.492)		(3.199)		(-3.829)	
		Non-Farming			-0.065	1.8			-0.018	1.9		
					(-0.492)				(-0.130)			
		Farming			-0.089	1.7			-0.05	1.7		
					(-0.695)				(-0.380)			
User-charge	r	r_1	1.496 ***	4.0	1.692 ***	4.5	1.805 ***	4.0				
			(4.422)		(5.144)		(5.903)					
		r_1							2.001 ***	6.7	2.046 ***	6.0
									(6.468)		(7.148)	
wages	w		14.907 **	1.6	15.520 **	1.7	16.897 ***	1.6	12.460 **	1.8	12.892 **	1.7
			(2.335)		(2.502)		(2.875)		(1.928)		(2.105)	
CPRs	E	$CPRs_1$	1.912 ***	3.0	1.984 ***	3.0	2.025 ***	3.0				
			(6.764)		(7.599)		(7.960)					
		$CPRs_2$							1.977 ***	4.8	1.996 ***	4.6
									(7.384)		(7.729)	
R^2			0.615		0.677		0.685		0.661		0.685	
F			19.383 ***		14.797 ***		21.011 ***		13.800 ***		20.16 ***	

Note: t-values are given in parentheses. **Significant at 5% level, and ***significant at 1% level. VIF is the variance inflation factor .

6. Final Remarks

In this paper, we have studied the relationship between the developments of eco-industries such as ecotourism and the community structure. From a theoretical perspective, we incorporated the CPRs approach and focused on both the structure of a community's cooperativeness and its effect on various outcomes such as local development of agriculture and tourism. Moreover, empirical research on factors that determine the system and situation of the management of CPRs in Japanese rural areas has been analyzed. By using the data of the 2005 Census of Agriculture and Forestry in Japan, cooperative behaviour in the community related to land use or traditional cultural events and the structure of community-based participation of the people was investigated.

The major findings of the paper are as follows. In Japanese rural areas, socio-economic factors have been adversely affected by the decline in the primary sector, its major industry. Accordingly, the community structure has also changed drastically. It is proven that the factors that determine the cooperativeness of various community activities are complicated; however cooperative activities for festival and events, or preservation of the cultural and natural environment in the community seem to be major factors keeping community activity cooperative. It is also proven that a factor like preservation of the cultural and natural environment can have such a positive effect that the cooperativeness in the community can positively affect the community's welfare.

Last but not least, from a theoretical viewpoint, it can be easily proven that the effective management of CPRs to keep the local community sustainable should be dependent on some cooperative activities by residents. However, from the empirical viewpoint, we could not make robust estimates of the significant relationship between cooperativeness and community welfare. This is partly because of a lack of adequate data sets and seems mainly due to the poor definitions of 'cooperativeness' and 'CPRs' for empirical research. These are further tasks to be done.

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