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Land management issues in depopulated areas of Japan

Yoshiaki Iiguni* and Yukio Yamamoto (Kochi University)

Abstract:

This paper aims to clarify issues of the land management in depopulated areas of Japan and examine measures for sustainable use of the land.

The depopulated areas experienced rapid depopulation by massive migration of young inhabitants towards urban areas by 1970s. Recently depopulation reached a new stage, which is caused mainly by natural decrease in population. Some communities disappeared and the number of community facing danger of disappearance, which is named "marginal community", is increasing. Corresponding to decrease of the number of local inhabitants, secondary nature has declined and induced external diseconomy through deterioration of environment for life and production. The external diseconomy induces further depopulation and vicious circle of inhabitants' action and nature reaction has begun.

To break this vicious circle, sustainable use of the land is necessary. However, market of the land failed and does not function well due to incomplete information related to landowners and boundary of each parcel so on. Before the rapid growth, this information has been shared among inhabitants by their intimate networks, which can be called as social capital liking to the local land. The social capital decreased by migration and aging and currently even inhabitants lack the information considerably. Reconstruction of social capital is necessarily. The new social capital should be formed not only by local inhabitants but also by local economic agencies with assist of autonomous bodies. Raise of compliance level to keep environment by the national government is also important to recover the market function. It is an urgent task to design and to implement such multi-level governance system which realizes sustainable use of the land in depopulated areas.

Keywords:, land management, depopulation, aging, social capital, Japan

Introduction

Rapid growth of the economy after WWII induced massive migration from rural areas to urban areas, which created under- and overpopulation. In 1970's, migration of younger generation changed societies in rural areas dramatically. Most of successors of the families in rural areas moved to urban areas, and elderly parents were left, which was named first depopulation stage by Nagata (Nagata (1988)).

From 1990, the second depopulation stage emerged. It has been mainly caused by natural decrease in population. The age of a current main age-group in rural area is from 75 to 84 years old. The age-group is also major farmers' age-group and still a core group of community activities. The group is the last group which decided settle down in rural areas before the rapid growth (1955-1973). In accordance with aging of the main age-group, depopulation has been accelerated by natural decrease. Within the next 20 years, the trend will be kept and the population of rural areas will become smaller and smaller.

The area of depopulation is defined by the Act (the Act on Special Measures for Promotion for Independence for Depopulated Areas (Act No. 15 of 2000))[1]. Though the current ratio of the population to the total one is only 8.8%, the ratio of the land is over half (57.3%, MIC (2008)). Further depopulation of these areas will move landowners of the areas to urban areas and might make it difficult to use the resource, especially land. The land is divided into small-pieces. On average, the size of farm land is less than 1 ha in the western Japan. In the case of forest land, more than half of the owners has only less than 3 ha (Census of Agriculture and Forestry 2005). The transaction cost to communicate and negotiate with the owners for use the resource in the areas will be easily higher than the benefit. As the result the resource in the areas might become uncontrollable in many areas.

This paper aims to clarify change and issues of the land management in depopulated areas of Japan and examine measures for governance of the land in depopulated areas.

The analysis is focused just on Japan. But the resource management in depopulated areas will not be Japan specific issues. The issues have been caused mainly by rapid growth.

[1] It was defined by a past depopulation rate from 1965 to 1995 and the rate of elderly people (over 65 years old) so on.

The speed of economic development of Japan is much faster than that of European countries. In the case of European economies, they have enough time to adapt to new situation and can change socio-economic structure. In our case, however, the growth term was too short to adapt. The rapid growth is called "compressed economic development" (Watanabe et al (1996)) which has been already experienced by South Korea and Taiwan and will be experienced by the most of other economies of Asia in the near future. The Japanese issues in depopulated areas and the experience would be also shared by the other Asian economies in some kind of form.

1. The emergence and rapid increase of "marginal communities"

An outstanding survey on dynamic change of communities in depopulated areas was done by Ohno (Ohno (1995), (2005). He classified communities[2] into four categories shown in the Table 1.

< Table 1 Classification of communities in terms of its sustainability>

Ohno classified the communities in depopulated areas in terms of its sustainability. In the beginning of 1990s, most of the communities were still sound and seemed sustainable. Researchers concentrated how to revitalize the communities. But Ohno found a syndrome of dying community. He sets his research field on central part of Shikoku Island (figure 1) which is known as the most sever condition to live in mountainous areas of Japan because of high attitude and steep slopes of habitation area. In this area, a few communities have begun to disappear in the beginning of 1990s. Ohno paid attention to these communities and the other critical communities facing danger of disappearance as well. He named the later as a "marginal communities". The community is defined with two criteria. One is a statistical criterion, i.e. the rate of elderly inhabitants of the community is over 50%. The other is qualitative criterion, i.e. main function carried by the community (maintenance of local road and irrigation, celebration of local tutelary etc., see Table 1) cannot be kept.

<Figure 1 Location of Shikoku Island and Ohtoyo cho>

[2] Japanese community in rural areas is called as a "*shuraku*". Autonomous district (named "cho", "machi" and "shi") composed of generally 30 to 100 shurakus.

He guessed the number of marginal communities will increase rapidly and stressed necessity of prompt action by the government. The hypothesis has reality since 2000 not only in Shikoku Island but also all over Japan. MIC (Ministry for Internal Affairs and Communications) has carried out national-wide surveys of communities in depopulated areas. The survey in 2011 shows the number of communities in depopulated areas is 64,954. 93 communities have disappeared for the last 4 years. The number of the statistically defined marginal communities [3] is 10,091. The share to total communities is 15.5%. In 575 communities, all of the inhabitants are over 75 years old.

The marginal communities do not dominate depopulated areas. However, they can clearly show the currently most sever and coming common issues of depopulated areas. Based on the observation, we can foreknown what will happen in the future without any action.

The next section focuses on a field which Ohno surveyed, and clarifies what happens in the areas increasing the share of marginal communities.

2. Land management issues: a case study

(1) Overview of the study field and population change

The study field is a autonomous body named Otoyo cho[4] which locates in the central part of Shikoku Island (Figure 1). It has a population of 4,720. The number of elderly inhabitants is 2,788. The rate to the total population is reached to 59%. The number of households is 2,312. The total area is 31,494 ha. The forest areas is 27,778 ha and its shares around 88% of the total land. The main industry is construction, manufacture and forest industry.

Population change of Otoyo cho is characterized by rapid depopulation and aging. Figure 2 shows the drastic change. The current population is only quarter of the population in 1960. The rate of elderly inhabitants has increased since 1970 rapidly and now the ratio of inhabitants over 75 years old is more than 25%. Main cause of the reduction is decline of primary industry, agriculture and forest industry due to market liberalization and unfavorable

[3] Statistically defined marginal community means the communities satisfying only the statistical condition; the ratio of inhabitants over 64 years old is more than 50%.

[4] The “cho” means a unit of autonomous district.

condition for production.

<Figure 2 Population change and the rate of elderly inhabitants in Ohtoyo cho >

In accordance with reduction in the population, the number of newborn babies is also reduced. For the last five years, the number is only 20 or so a year. By now eight elementary schools are closed or temporally closed. Only two elementary schools are run.

Change of communities is also drastic. Figure 3 and 4 shows the rate of elderly inhabitants of each community in 1991 and 2005 respectively. In each figure, communities are painted with different shade of color corresponding to the share of elderly inhabitants to total inhabitants. A community is painted whitely is a disappeared community. Ohno defined marginal community with two criteria namely statistically and qualitatively. The figures show statistical aspects. From these figures we can see statistically defined marginal communities extraordinarily increase for the 14 years. In 1991 the number of them is only 4, but 53 in 2005. The total number of the communities in this autonomous body is 86. Then the ratio of marginal communities increases from less than 5% to over 60%. Now the autonomous body, Ohotoyo cho, itself faces danger of disappearance.

(2) Decline of secondary nature and deterioration of condition for local life and production

Depopulation and aging have impact on primary industry severely. Lack of producers has increased abandonment of farming and forest management. Figure 5 indicates change of the agricultural and forest land use in Ohtoyo cho. There were paddy fields over 600ha and orchard and upland over 400ha. However, currently the both of fields are squeezed, and the former is 106ha and the latter is 38ha. Decline of pasture and grass land is much sharp. In 1965, the area was 1070ha. But now most of it has disappeared.

<Figure 5 Change of land use in Ohtoyo cho >

Farmland is secondary nature which is nature with human intervention. Without the intervention, such like cultivation or management, the nature will be devastated and will return back to the original nature gradually. The devastated nature is not always beneficiary but harmful to local inhabitants. For example, the land without cultivation becomes devastated land which destroys fascinating landscape of terraced paddy fields in former times, and provides suitable living space or roads for wild animals. The desolate landscape deteriorates

the quality of local life. Proliferation of wild animals decreases the farm or timber production and disturbs local life. This external diseconomy promotes further depopulation of local inhabitants, which will induce expansion of devastated nature. It results in a vicious circle of local inhabitants' action and the nature reaction.

The vicious circle is observed in the case of forest industry as well. After WWII, timber price skyrocketed in postwar reconstruction times. The high price induced foresters to increase plantation of needle leaves tree, mainly cedar and cypress. Figure 6 shows change of plantation area in Ohtoyo cho. The plantation was accelerated from the second half of 1960s and slowed down in 1980s. Japan liberalized the logs and timbers market from 1960s step by step. The increase of the import depressed the market and the price fell down which slowed down the plantation activities and forest management.

According to prescribed forest management schedule, planted artificial tree should be thinned around every 10 years. When cedars and cypresses are planted, the density of nurseries per 1.0 ha is 3,000. Logging was planed 40 or 50 years after the plantation. Between plantation and logging, thinning should be implemented to keep suitable density of trees at each growth stages. The density should be about 1,000 trees or less per 1.0 ha when they are logged. However, the low price since the second half of 1980s made foresters lose their interest in forest management. Most of the foresters gave up the management and thinning. As the result, highly dense artificial forest with high density of trees emerged everywhere.

The canopy of these abandoned artificially planted forests was closed and light stopped reaching the ground. The forest ground was thus deprived of bottom grasses and came to be covered with only small amount of fallen branches and stones without humus. Tree roots in the dense artificial forests ceased to grow adequately, thereby making the forest trees prone to wind damage.

It was common that cedars and cypresses were planted on paddy field and upland when inhabitants moved away from the area. The trees grew and formed dense and devastated forests which reduced open space surrounding remaining inhabitants and raised risk of landslide so on. The deteriorated environment induced further depopulation and vicious circle arose.

Another critical problem is the decline in the water source recharging capacity of forests.

In healthy forests where tree thinning is properly implemented, bottom grasses and branches build up and form soil with spongy texture. When rain falls, the soil absorbs the water content and this is stored underground. At times of torrential rainfall, this spongy soil absorbs excessive water to prevent flooding, while at times of drought, the absorbed water reserves are released. However, such buffer functions are said to deteriorate in dense artificial forests. Accordingly the forests without proper management in watersheds causes sever problem in water supply to downstream areas.

<Figure 6 Change of plantation areas in Ohtoyo cho >

4. Decrease of social capital and failure of the land market for rent

By now low profitability of primary industry deter inhabitants from use of the local land. Low profitability cannot realize sustainable use. However, the recent technological progress is changing the situation. Forest industry is a typical example. Highly mechanized technology was introduced for the last two decades. The minimum optimal scale of the current forest industry is about 200 ha. The size is far beyond the average size of Japanese forester (6 ha). The foresters or forest owners' associations should collect the land over 200 ha.

Before rapid growth, it might be easy to collect the land, because most of local landowners lived in each community and there is a network among landowners. The owners can identify the other landowners at once and the others' boundaries of parcels as well. The present situation of the land was also known easily. Figure 7 indicates this situation. The network of landowners can be named social capital in the meaning of N. Lin (Lin (2000)). The social capital plays an important role to distribute the resource effectively via the network. The forester collecting land can consult with the leader of the community and negotiate with the owners living there. The transaction cost is not high.

<Figure 7 Network of landowners before rapid growth>

Currently the situation has been quite changed, which is summarized in Figure 8. One of the features of the present network is migration of the owners (case a, b, e in fig. 8). In the case of Ohtoyo cho, more than 30% of landowners live outside of the area. The network between local inhabitants and migrated owners are kept only partially (case e). In the other case, it was broken out (case a, b). Because of considerable owners migrated, the boundaries

of the land can not be identified easily (case a, d, e)[5]. Low profitability made the owners lose their interest in the land management, and also give up the succession (case a).

If a potential user wants to use the land of the community, he/she should identify the name and address of the landowners and identify the boundaries of the land. Concerning the land, succession of which has not completed, the names of dead persons are listed in the land register. Then the user should find and negotiate each holders of the right to succession by his/her effort[6]. Information of the land sometimes lacks and sometimes owned by only landowners outside of the areas. Such incomplete information brings high transaction cost, which hinders efficient use or lets the land market for rent disappear. In other words, incomplete information induces market failure.

< Figure 8 Current networks of landowners and incomplete information>

The situation is same in agriculture. A new technology such like solar electric fence and a special insecticide to ticks was developed. Efficient extensive pasturing can be run easily. But collection of the land becomes a bottle neck.

5. Reconstruction of social capital and multi-level governance

If breaking down of social capital causes ineffective land use, we should reconstruct the capital. Over the decades, often the reconstruction has been attempted by various organizations; the communities, autonomous bodies[7] and local economic agencies (ex. farmers' cooperatives and forestry owners' association). Some communities sent letters to migrated successors and appealed the importance of discussion among landowners about local land use from now on. Forest owners' association contact their members outside of the area

[5] Japanese government implemented national land survey after WWII and identifies boundaries, but the implemented area is still 42% to the total mountainous land.

[6] There is the land tax ledger in autonomous body, in which at least a owner or a holder of right to succession is listed. The information can not be disclosed because of regulation by Act on the Protection of Personal Information.

[7] Agricultural commission, which controls land transaction, also has tried to reconstruct the social capital.

and offer to large-scale forest management program including the members' land. These trails have not been succeeded fully.

The difficulty of the reconstruction is due to indifference of landowners. Most of them has lost interest in the management of their land and leave the land as they are. They are not blamed if they abandon management that causes external diseconomy.

Japanese government has established some measures to cope with the problems. For example, the Forest Act (art. 10) defined a procedure to enforce landowner to thin the forest if the forest needs to be thinned and otherwise some disaster will be brought. The Land Act (art. 6) also defined similar a procedure. Though the government recognized properly the necessity of such regulation, these procedures have never been carried out after the enactment.

These stipulations aim to raise compliance level to keep environment higher than present level. This means raise of a reference point defined by Hodge, which is the level of responsibility that farmers are expected to bear for conservation of rural environment (Hodge (1989)). The concept was derived from reference profit defined by Kahneman (Kahneman et al (1986)). According to their discussion, the level depends on which level of responsibility or profit is recognized "normal" by the society. As Bromley and Hodge stressed, raise of the reference point takes long time. It will be achieved after long conflicts among stakeholders (Bromley and Hodge (1990)).

EU and Swiss government have successfully raised the reference point of farmers in the form of cross compliance. It took more than 10 years in both cases. In Japan, it would be also possible to raise the reference point, even though it might take much more time than European case. In addition to the Forest Act (art. 10) and the Land Act (art. 6), the Forest Act was revised in this April that introduced a new clause which can make autonomous bodies build forestry roads even when some landowner is unknown under some conditions. Therefore we already have such stipulations that can raise the reference point. It is important to actuate these stipulations practically as the first step.

If the reference point is raised effectively, landowners begin to search agencies which can manage the land. It means the information of the owners will be revealed voluntarily and the incomplete information is considerably mitigated. When the function of the land market

for rent is improved, the reconstruction of the social capital by various organizations becomes much easier.

Concerning management of boundaries of parcels, the autonomous bodies should fix them by national land survey. The following tasks to keep marks of the boundaries and to communicate with the landowners should be carried out by the various bodies composing of the communities and economic agencies so on.

6. Concluding remarks

Before rapid growth, the land in rural areas is managed by local inhabitants through the social capital linking to the local land. They can easily identify where the boundaries of parcels and who are landowners. However, recently migration and natural decrease in population decreased the social capital gradually. The network of landowners has been broken off. Landowners lack boundaries information and local inhabitants can not know where landowners live and who they are. In such incomplete information, the market for rent can not function well and market failure arises. To recover the function of the market and realize sustainable use of the land in the depopulated areas, reconstruction of social capital is necessary. The new social capital should be formed not only by local inhabitants but also by local economic agencies with assist of autonomous bodies and raise of compliance level to keep environment (reference point) by the national government.

It is an urgent task to design and to implement such multi-level governance system which realizes sustainable use of the land in depopulated areas.

Reference

[1] Bromley, D. W. and I. Hodge (1990) Private Property Right and presumptive Policy Entitlements: : Reconsidering the premise of Rural Policy, *European Review of Agricultural Economics*, Vol. 17, pp. 197-214.

[2] Hodge, I. D.(1989), Compensation for Nature Conservation, *Environment and Planning A*, Vol. 21, pp.127-1036.

[3] Kahneman, D., L. Knetsch and R. Thaler (1986), Fairness as a Constraint on Profit Seeking: Entitlement in the Market, *the American Economic Review*, Vol. 70, No. 4, pp. 728-741.

[4] Lin, N. (2000), *Social Capital: A Theory of Social Structure and Action*. Cambridge: Cambridge University Press.

[5] Ministry for Internal Affairs and Communications (MIC) (2008) Current measures for depopulation 2008 (in Japanese)

[6] Ministry for Internal Affairs and Communications (MIC) (2011) Outline of the survey of present situation of communities in depopulated areas etc.

[7] Watanabe, T. and M. Kim (1996) Korean Economic Development, Keiso shobo (in Japanese)

[8] Nagata, K (1988) National Use of Local Resource, Rural Culture Association Japan (in Japanese)

[9] Ohno, A. (2005) *An introduction to environmental sociology of mountainous villages*, Rural Culture Association Japan (in Japanese)

[10] Ohno, A. (1993) Depopulation and the Aging in Mountainous Villages in relationship t Environmental Problems, Ogura, T. ed., *A Step towards the Shift of Agriculture, Forestry and Fisheries to Ecological Industries*, Food and Agriculture Policy Research Center, pp.75-98.

Table 1. Classification of communities in terms of its sustainability

Type	Criteria
Sustainable community	The ratio of residents less 55 years old is more than 50%. The collective life is well kept.
semi-marginal community	The ratio of residents over 54 years old is more than 50%. It might be difficult to get residents who can keep collective activities in the near future.
Marginal community	The ratio of elderly residents over 64 years old is more than 50%, and the collective activity in the community has declined. It becomes hard to keep collective life.
Disappeared community	Disappeared cummunity

Source) Ohno (2005) p.22.

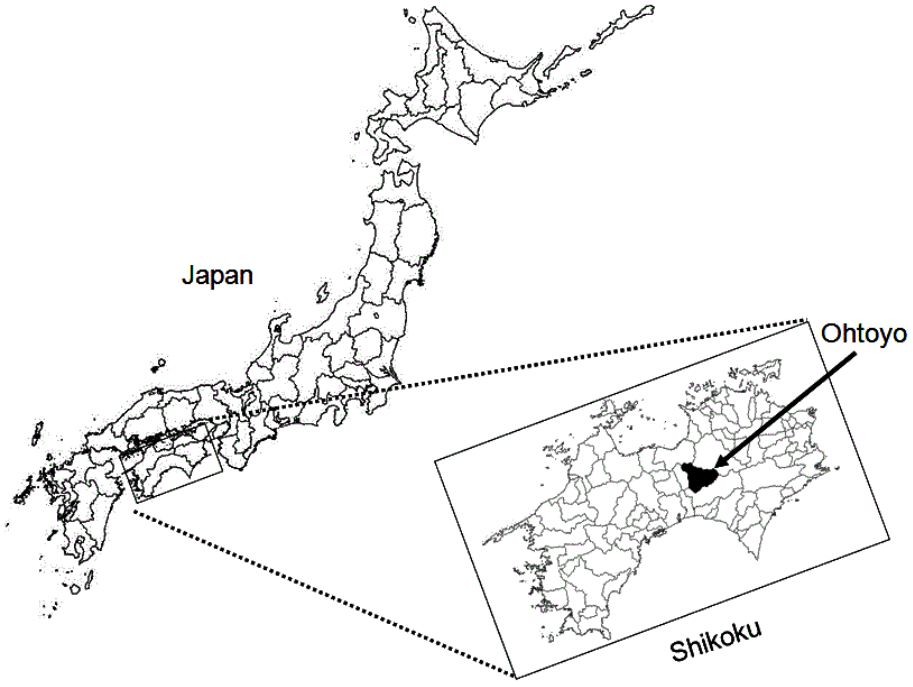


Figure 1 Location of Shikoku Island and Ohtoyo cho

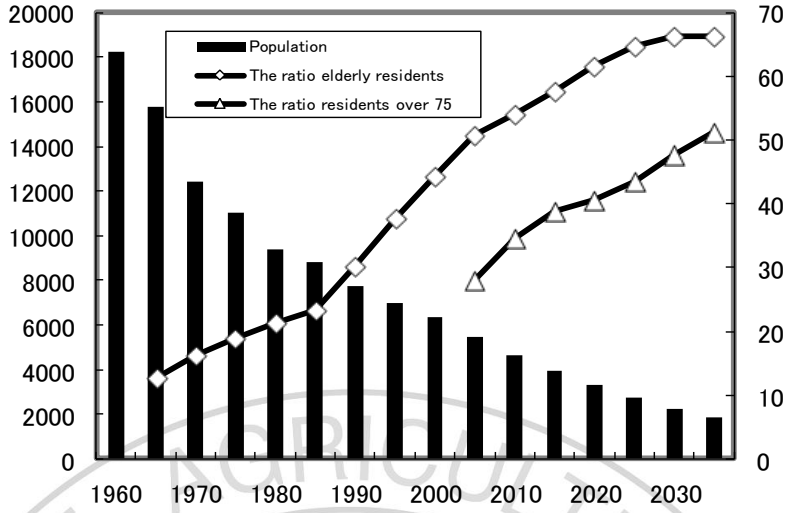


Figure 2 Population change and the rate of elderly inhabitants in Ohtoyo cho

Source) Census (MIC), National Institution of Population and Social Security Research

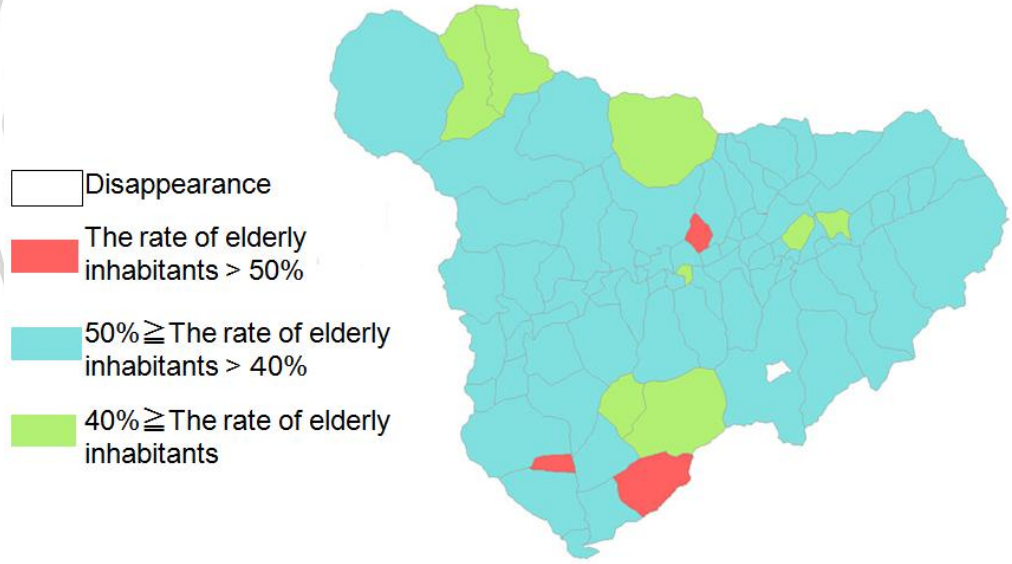


Figure 3 The rate of elderly inhabitants by community in Ohtoyo cho (1991)

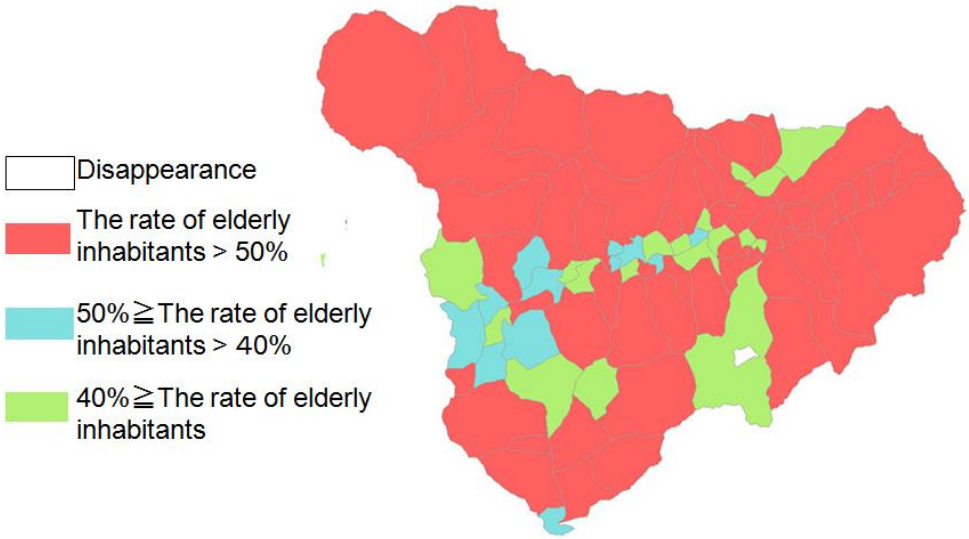
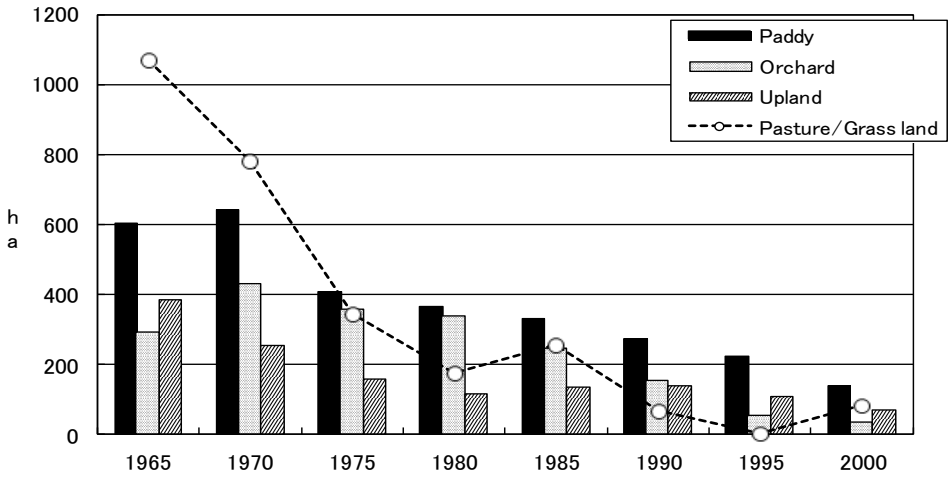


Figure 4 The rate of elderly inhabitants by community in Ohtoyo cho (2005)



Source) Census of Agriculture and Forestry

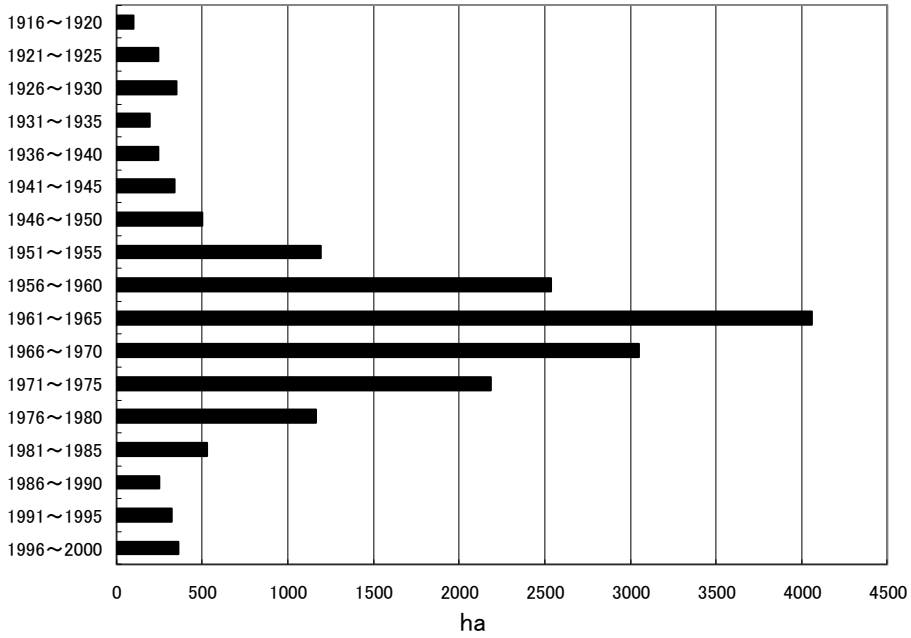


Figure 6 Change of plantation areas in Ohtoyo cho

Source) Census of Agriculture and Forestry

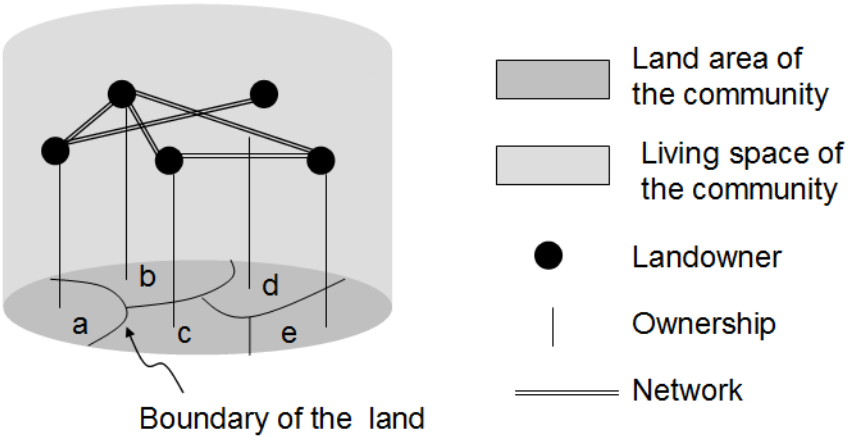


Figure 7 Network of landowners before rapid growth

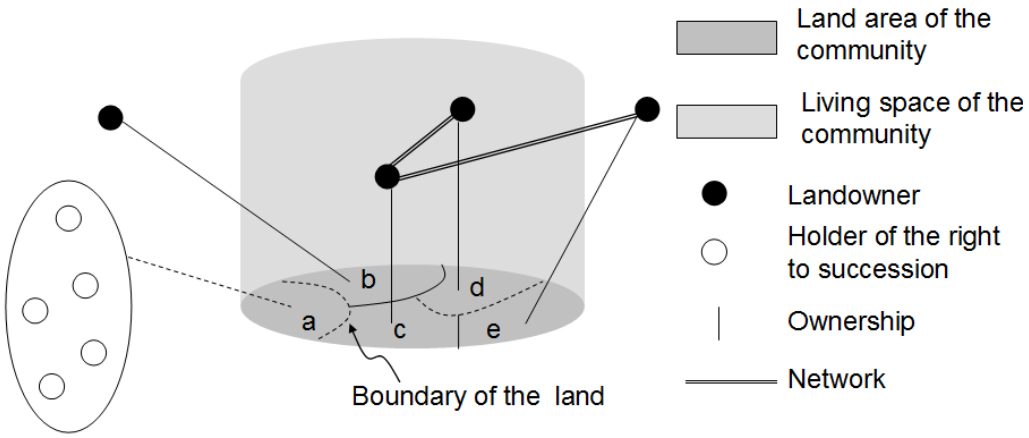


Figure 8 Current networks of landowners and incomplete information