

Relationship Between Geographical Condition and Cultivation Form of Farm Households in Mountainous Village

- Case study on Kutsuwai Village in Shimonoseki City-

Sachiko Yamamoto¹, Hirotaka Watanabe² and Mahito Nakazono³

¹ Assistant Prof., Faculty of Engineering, Information and Systems, University of Tsukuba, Dr.Eng.

² Staff, Plants Associates Inc., Mr. Eng.

³ Prof., Graduate School of Science and Eng., Yamaguchi Univ., Dr. Eng.

Abstract

This paper features a small-scale mountainous village in Kikugawa town. The purpose of this study is cleared factors that agricultural lands were abandoned by analyzing relationship between geographical condition and labor. And more, households of the village are classified with the farming management types, and the solution method for the farmland good use is shown at every patterns.

At the classification, the quantification theory type3 and cluster analysis are used. Analysis indicators for the classification are the following five; family labor, farmland area, the number of farmland, the rate of abandoned cultivated, and the rate of a riverhead from mountain. 31 households are classified these five patterns; G1: Large scale property and two generations type, G2: Near distance, middle scale property and employee type, G3: Large scale property and non agri type, G4: Small scale property and labor type, G5: Long-distance farmland and supporter type.

Keywords: Mountainous Region, Land Use, Farmer, Abandoned Cultivated Land, Quantification Theory

1. Introduction

The ageing and the short of farmers are proceeding and problems about utilizing and maintaining farmland are piling up as a background of the ageing and the decreasing population in rural areas. The area of abandoned cultivated land is 209,000 ha and the rate is 10.3% in the mountainous region (including the middle agriculture region and the mountains region) in 2006. The rate is higher than urban region (6.0%) and flatland region (7.2%). In the mountainous region, the improvement of infrastructure for agricultural production isn't enough because the region has many bad condition areas for agriculture, for example, a sloping land. Low productivity of agriculture has an influence on the abandonment of cultivation. It is necessary to do a relevant analysis between geographical condition and cultivation form of farm households as for a factorial analysis of the abandonment of cultivation in the mountainous region.

Contact Author: Sachiko Yamamoto, Assistant Prof,
Faculty of Engineering, Information and Systems,
University of Tsukuba,
address 1-1-1 Tennodai, Tsukuba, Ibaraki, 305-8577,
JAPAN
Tel: +81-20-853-5222
e-mail: sachiko@sk.tsukuba.ac.jp

This paper features a small mountainous village in Kikugawa town Shimonoseki city Yamaguchi prefecture and aims to clear factors that affect the abandonment of cultivation with a relevant analysis between geographical condition and cultivation form of farm households. And more, after farm households are classified by the agriculture manage pattern, solutions for issues of farmland utilization are shown at each types.

2. Outline of Survey

2.1 Outline of Village and Population Change

Research object area is Kutsuwai village located southeast area in Kikugawa town Shimonoseki city (Fig.1,2) It is the mountainous farm village having terraced field (tanada) in valleys. Main public facilities are Kutsuwai branch of Toyohigashi elementary school (closed in 2007) and a public hall. There are no supermarket and medical facility. 104 peoples and 32 households live in the village. The aging rate is 42.3% (the census in 2005) and the decreasing rate of population is 25.2% (1995-2005), population decrease and aging are promoting rapidly.

2.2 Geographical Characteristics

The village had been made along a valley and extended north and south (Fig.3). North area is higher than south. Residences are located at from 50 to 100 meters above sea level and surrounded by forests. There are few flatlands and almost farmland

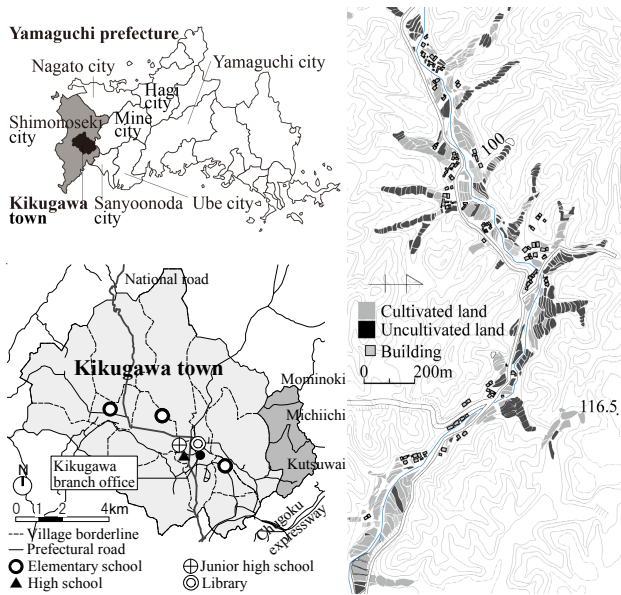


Fig.1 [Left] Kutsuwai Location Map
Fig.2 [Right] Farmland Map in Kutsuwai Village

Table.1 Survey Method and Contents

Items	Object	Method	Contents
Farmland use conditions	Farmlands in Kutsuwai village	•Trace of aerial photographs •Field survey	A farmland map is made and the condition which cultivate or uncultivated is written on the map.
Hearing	32 households living in Kutsuwai village	Individual visit	Household composition/The head of household/Inheritor/Farmland use condition/Supporter at a busy season for farmers/An intention to use farmland in the future
Replenishment	Farmlands in Kutsuwai village	•Numerical information is calculated on the farmland map. •Actual measurement	Farmland area/Straight line distance from farmer's house to farmlands/Vertical drop between farmer's house and farmlands/width of a road closing to farmlands/The source of water for agriculture

is terraced fields cleared mountainous land. So farmland's area is small and an elevation is high. Farmland consolidation had not been done in this area. When a river work was done in 1995, channels and paddy fields were finished maintenance along the river. As for Farmland in hilly area, the water source is reservoirs.

2.3 Survey Method

Table.1 shows survey items. Firstly, a farmland map was made by trace of aerial photographs and field survey and the condition which cultivated or uncultivated was written on the map. Secondly, hearing was done for 32 households living in Kutsuwai village. Thirdly, numerical information was calculated on the farmland map and the database was made every farmland. Survey period is from October 2008 to January 2012.

3. Classification of Agricultural Management Form by Geographical Condition and Family's Manpower

3.1 Classification Process

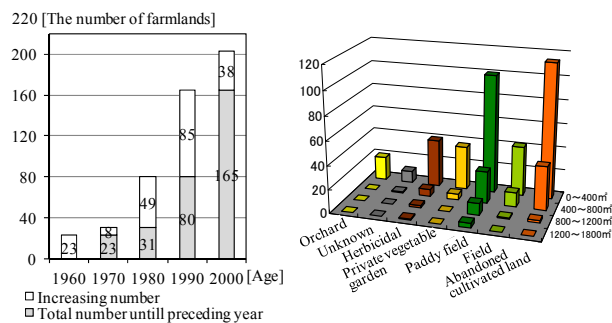


Fig.3 [Left] Number of Abandoned Cultivated Land
Fig.4 [Right] Utilization form of farmland

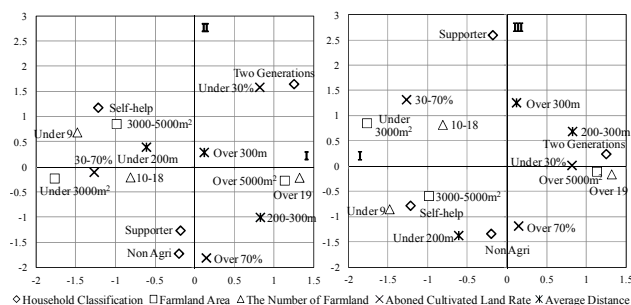


Fig.5 Distribution of Category Score by quantification theory III

Table.2 Average of Category Score Classified by 5 Groups

Group		1	2	3	4	5	Avg.		
Average of Category Score	I axis	0.99	-0.04	0.39	-0.86	-0.09	0.08		
	II axis	0.51	0.65	-0.83	-0.12	-0.46	-0.05		
	III axis	0.20	-0.20	-0.63	-0.23	0.89	0.01		
Category	Household Classification	1. Non Agri			5	4		5	
		2. Supporter					6	6	
		3. Self-help		4			3		4
		4. Two Generations	5	4					5
	Farmland Area	1. Under 3000m ²				5	2	4	
		2. 3000-5000m ²		4		2	1	2	
		3. Over 5000m ²	5	4	5			3	4
	The Number of Farmland	1. Under 9		2		5		4	
		2. 10-18		3	1	2	4	3	
		3. Over 19	5	3	4		2	4	
	Abandoned Cultivated Land Rate	1. Under 30%	5	6			1	4	
		2. 30-70%		2		4	3	3	
3. Over 70%				5	3	2	3		
Average Distance	1. Under 200m		6	3	4		4		
	2. 200-300m	2		2	1	3	2		
	3. Over 300m	3	2		2	3	3		
The Number of Households		5	8	5	7	6	6		

Objects of the analysis are 38 households having farmland in the village, this is including 6 households living in outside area. Then 7 households of non agri are excepted and 31 households are selected for the analysis. Indexes are [1]household classification by family's manpower, [2]farmland area retained by a farmer, [3]the number of farmland, [4]the rate of abandoned cultivated land, [5]the average distance between farmer's house and farmland. Table.2 shows items and categories using at the analysis. 31 households are classified by quantification theory III.

3.2 Results of the Classification

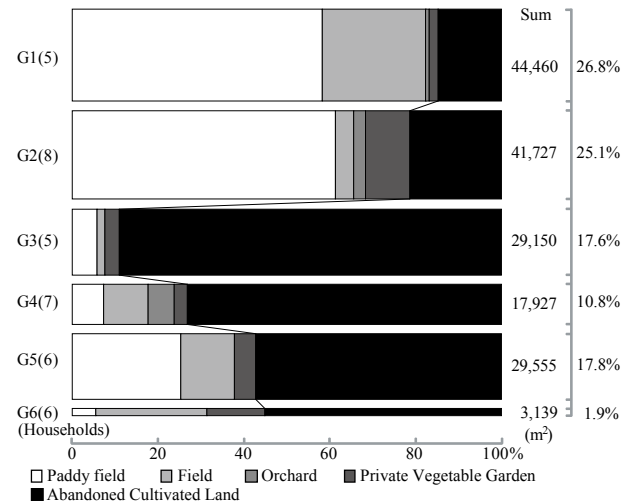
At the result, cumulant regarding total dispersion is 0.22 till I axis, 0.39 till II axis, 0.54 till III axis. Figure.5 shows distribution of category score. As for I axis, category of "area over 5000 square meter" and "the number of farmland over 19" are distributed on the plus side and the minus side is "area less than 3000 square meter" and "the number of farmland under 9". So I axis can be interpreted as the possession scale. About II axis, category of "farming by two generations" and "abandoned cultivated land rate less than 30%" are distributed on the plus side and the minus side is "there is no farmer" and "abandoned cultivated land rate over 70%". This means II axis shows "manpower" and "abandoned cultivated land rate of farmland". On III axis, "average distance over 300 meter" on the plus side, and "average distance less than 200 meter" on the minus side are distributed, it is shown the average distance axis.

Next, cluster analysis (Ward system, square euclid distance) is done. At result, 31 households are classified into 5 groups. Table.2 shows average of category score. As for group 1, the average of I, II, III axis is a positive number. It is shown that property scale is big and labor is secured. Family composition is "two generations" which have successors for agriculture, so labor will be secured in the future. Abandoned cultivated land rate is under 30%. So this group is positioned as "Large scale property and two generations type". Concerning group 2, average of II axis is a positive number, so there is no big difference of labor between group 1. Average of I and III axis is a minus number. This is shown that property scale is smaller than group 1 and the average distance is near. The distance of 6/8 households are under 200 meters. From the above, this group is "Near distance, middle scale property and employee type".

About group 3, the average of I axis is a positive and II, III axis is a minus number. It shown property scale is big, average distance is near. Because labor is few, abandoned cultivated rate is high. Property scale is over 500 square meters, but all households have not done farm in earnest, so abandoned cultivated rate is over 70% that is the highest in 5 groups. Therefore, group 3 is "Large scale property and non agri type".

Category score of group 4 is a minus number in all axis. It is shown that property scale and labor are small, and abandoned cultivated rate is high. 5/7 households have under 3000 square meters farmland. Labor is divided into "Non agri" and "Self-help". Abandoned cultivated rate is the second highest. So, group 4 is named "Small scale property and labor".

As for group 5, category score of I and II axis is a minus and III axis is plus number. Property



Note) G6 shows 7 households excluded at the analysis.

Fig.6 Area and Utilization Form of Farmland by Groups

scale and labor is small and average distance is long. It is a characteristic that all households have supporter. Farmland area is dispersed and the number of farmland is over 10. Average distance is divided 200-300meters or 300 meters. From this, group 5 is "Long-distance farmland and supporter type".

4. Case Study by Classified Patterns

Figure.6 shows area and utilization form of farmland by groups and figure.7-11 shows farmland map. Characteristics of groups are cleared by relevant analysis between household labor, property pattern and utilization pattern in this chapter.

4.1 G1: Large Scale Property and Two Generations Type (5 cases)

No.6 and No.22 have large farmland in south area. However these farmlands are far from owner's house, a condition is good because located along the road. 4 households excepting No.6 have "tanada" (terraced paddy field) in the valley. These fields have been cultivated except the highest altitude farmland. No.6 has a lot of abandoned farmland than other households. The reason is that there is a two-generation farmer, but the labor force is not enough for two people. No.22 is engaged in the dairy industry and plant a crop for cows to feed the paddy crop rotation. So, utilization form of fields accounted for more than 20%. G1 owns both the valley and the rice terraces of farmland good condition. Since the labor force has been secured, cultivation abandonment rate is 14.7% and the lowest.

4.2 G2: Near Distance, Middle Scale Property and Employee Type (8 households)

Farmland has aggregated to the north and south. Most of them are distributed in flatland around the

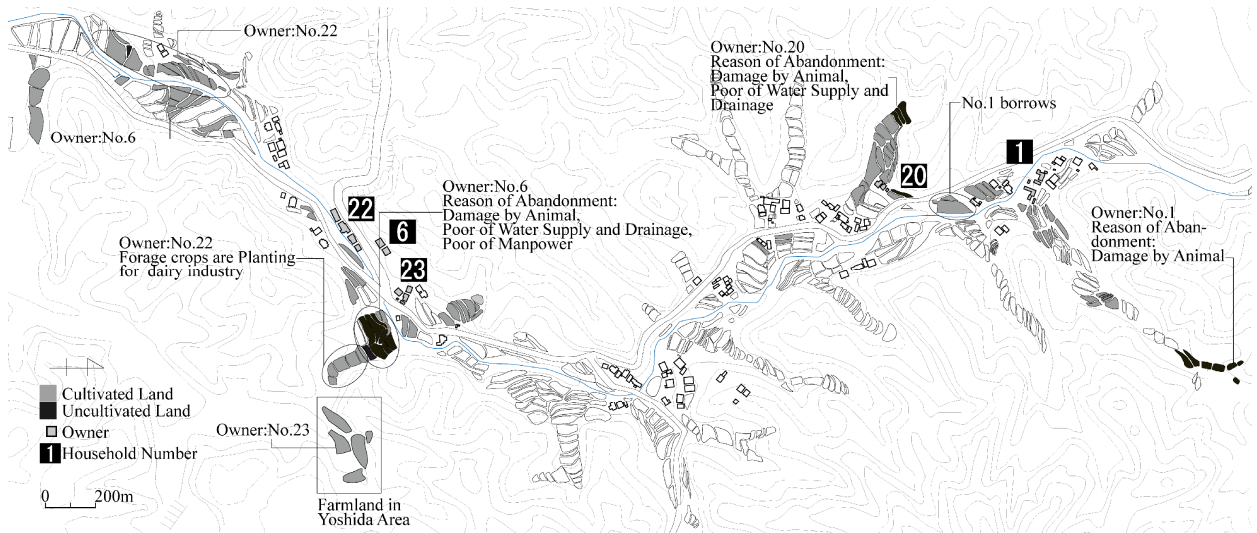


Fig. 7 Group 1

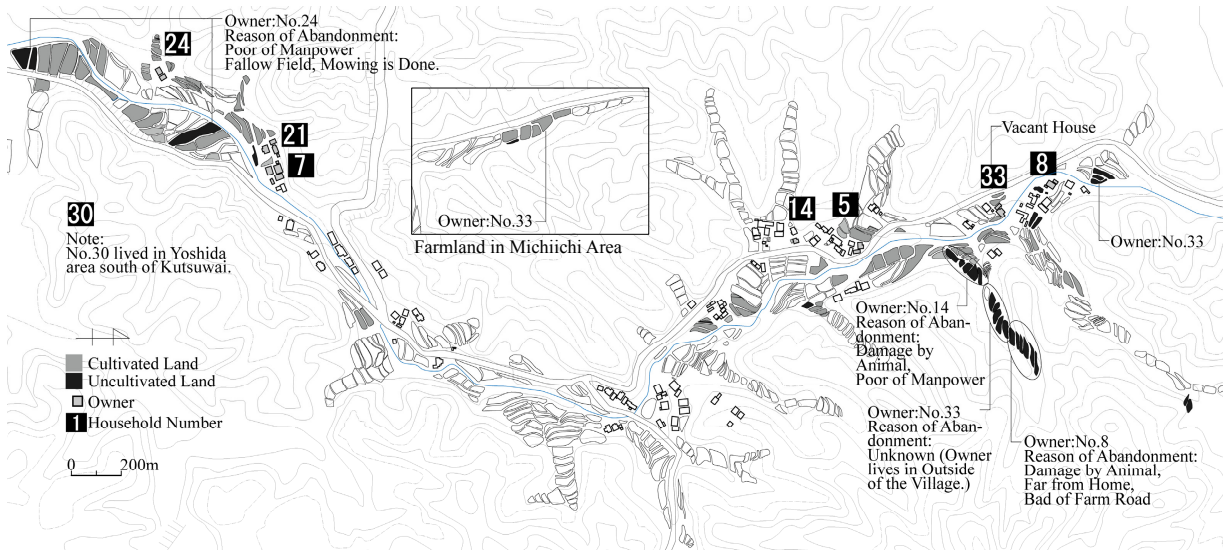


Fig. 8 Group 2

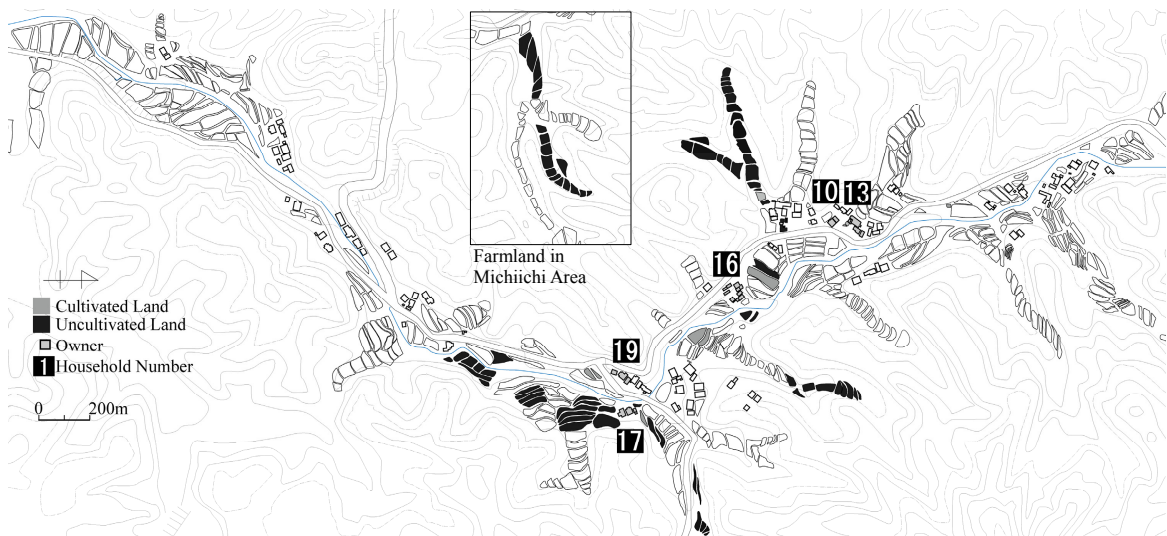


Fig. 9 Group 3

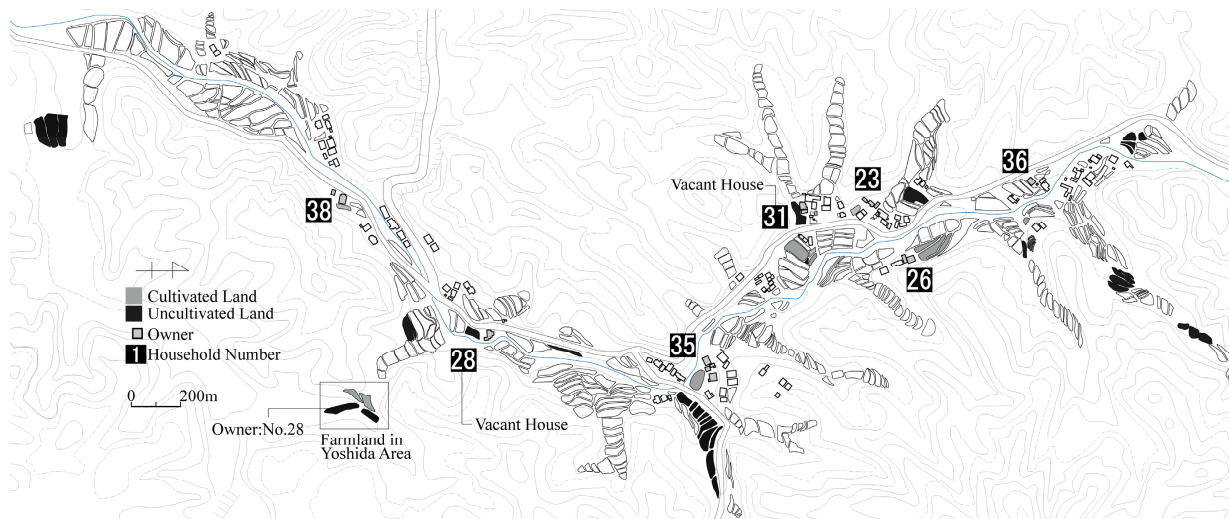


Fig.10 Group4

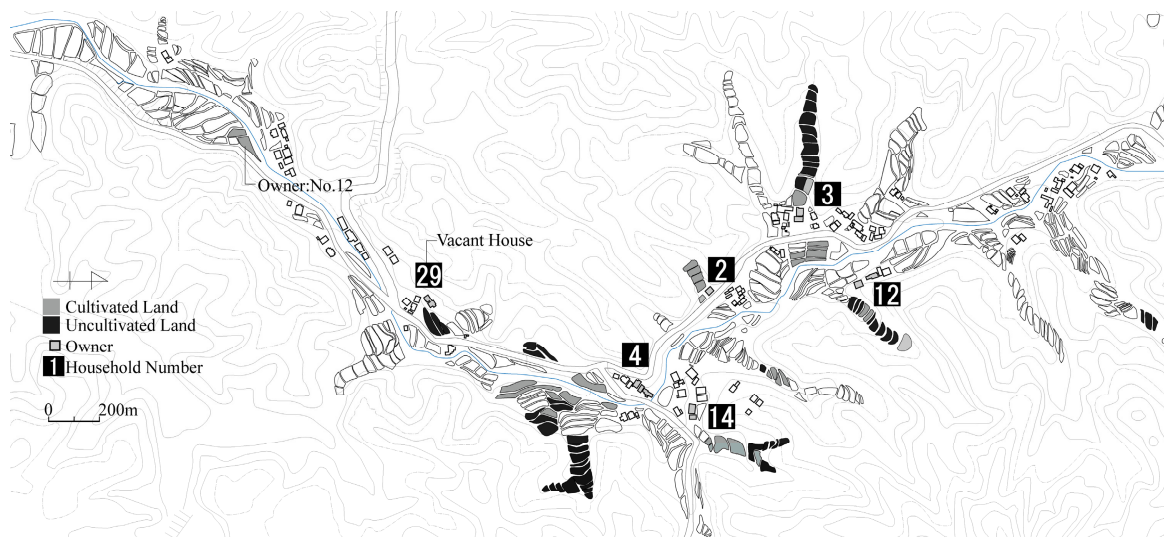


Fig.11 Group5

home along the road. Tanada in the valley are found some on the north side, but the number of flat farmland is more than group 1. This is a group that farmland condition is the best. Tanada have been abandoned due to reasons such as damage by animals. Although No.24 is two generations, farmers are 2 people, so the labor is shortage. A large area of southern farmland has been abandoned. Except for these, most of the plains have been cultivated, cultivated abandoned rate is second lowest in 21.5%.

4.3 G3: Large Scale Property and Non Agri Type (5 households)

Most of tanada are located to the mountain on the back of homes. Distance from home is close, but most of tanada are not cultivated. Cultivated farmland is a part of the flatland close to home. They make only the amount eating by themselves due to the aging of farmers. The rate of abandonment of cultivation in 88.9%, it is the highest in all groups.

4.4 G4: Small Scale Property and Labor (7 households)

Agricultural land of small area is distributed, and 2-3 sheets of farmland around home have been cultivated. No.28 and No.31 have lived in the out of the village. Because there are no farmers, all of farmland has been abandoned. Can be seen tanada in two places of the valley, farming has been abandoned by the labor shortage and poor farmland conditions. Abandonment of cultivation is the second highest rate in 73.2%.

4.5 G5: Long-Distance Farmland and Supporter Type (6 households)

Most of the farmland is tanada in the valley, the area of farmland per sheet is small and far from home. Therefore, the condition of farmland is the worst in 5 groups. However, relatives or village residents assist cultivation in the farming season, so lower elevations farmland of tanada is cultivated. The abandoned cultivated rate is 57.4%.

Table.3 Subjects and Measures for Farmland Use by Groups

Group	Characteristics	Issues	Measures
G1 Large Scale Property and Two Generations Type	Ratio of uncultivated land:14.7% • Owning agricultural land both flat and terraced rice fields • Having a next-generation successor	Utilization of partial uncultivated land	Selecting crops that are easy to cultivate
G2 Near Distance, Middle Scale Property and Employee Type	Ratio of uncultivated land:21.5% • Owning flat farmland • Having a core workforce and farming stably	Utilization of partial uncultivated land, Securing the leaders of the next generation	Selecting crops that are easy to cultivate
G3 Large Scale Property and Non Agri Type	Ratio of uncultivated land:88.9% • Almost of farmland is tanada, farmland condition is bad • All households are non agri.	Securing core workforce and support labor force	Lending farmland to local organizations
G4 Small Scale Property and Labor	Ratio of uncultivated land:73.2% Cultivating 2-3 sheets of farmland around houses	Securing core workforce and support labor force	Volunteer work on a farm by local organizations
G5 Long-Distance Farmland and Supporter Type	Ratio of uncultivated land:57.4% • Almost of farmland is tanada, farmland condition is bad • Difficult to cultivate by one family	Securing support labor force continuously	Ownership system, Volunteer work on a farm by local organizations

5. Conclusion

5.1 Results

- Households in Kutsuwai village were classified into next five groups by the relevant analysis between farmland condition and labor; G1: Large scale property and two generations type, G2: Near distance, middle scale property and employee type, G3: Large scale property and non agri type, G4: Small scale property and labor type, G5: Long-distance farmland and supporter type.
- G1 and G2 have over half of farmland area in the village, and these abandoned cultivated rates are low under 25%. G1 have both tanada and flat land, but abandoned cultivated rate is low. The factor is that labors have been secured enough. As for G2, farmland condition is good and labors have been secured, so it is done farming steady.
- About G3, G4 and G5, over half of farmland areas have been abandoned. Especially, the abandonment rate of G3 is the highest over 85%. The abandonment of cultivation has been advanced by synergism of bad condition farmland and small labor. G4 is every household has few farmland areas and includes absentee landlord's land and tanada, so abandoned cultivated rate is high. G5 farmland conditions are worse than G4 and G3. Nevertheless, the rate of abandoned farmland is low with the effect of supporter's labor.

5.2 Examination

Table.3 shows subjects for farmland use by 5 groups. Because having next-generation successor, G1 is expected to continuous farming. The subject is the utilization of partial uncultivated land. As a measure, it is good to cultivate crops relatively hassle-free, such as soybeans, buckwheat crops and rapeseeds. G2 has a core workforce, so can be farming stably, but it is necessary to secure the leaders of the next generation.

G3 is non agri. They have no will to continue agriculture. Therefore, it is important issue to find new farmers. It is better to lend farmland to local organizations. About G4, the issue for continuously agriculture is securing core workforce and support labor force. It should adopt volunteer work on a farm by local organization. G5 is difficult to cultivate by one family because labors isn't enough. The subject is to secure support labors continuously. The measures are introduction of the ownership system or volunteer work by local organizations.

6. References

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