

RESEARCH FOR LAND USE PROCESSING OF TEA PLANTATIONS IN A MOUNTAINOUS REGION

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Introduction

Tea cultivation practiced in Japan at the eastern end of the Silk Road. The climate of hilly and mountainous areas is suitable for cultivating high-quality tea. In addition, soil unsuitable for other crops is suitable for tea trees [1]. Currently many tea plantations have been cultivated a large-scale intensively and using Yabukita¹. In the past, many tea plantations had scattered small-scale tea plantation using the Yamacha² in mountainous region [2], [3]. However the population in the mountainous region has been decreasing because of depopulation and aging. Some villages are brink of survival. Therefore, we figured out the feature of the tea plantation landscape in the mountainous region [4]. And the purpose of this study is to figure out the transformation of the tea plantation in the mountainous region.

Methods

We analyzed the 1978 and 2010 topographical map of Mandokoro Eigenji town, Higashiomi city, Shiga Prefecture, Japan (Fig. 1).

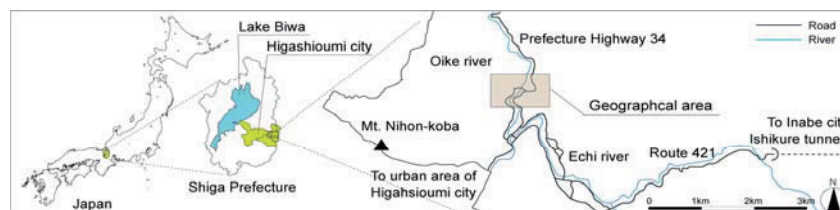


Fig. 1: Location of Mandokoro on the map.

For approximately 300 years, people of this area have been cultivating Yamacha² tea in traditional tea plantations (Fig. 2).



Fig. 2: A traditional tea plantation in Mandokoro.

We determined the number of tea plantations, the azimuth direction of the slope, the slope angle, the altitude of the tea plantations, the distance between the tea plantation and the house, and the difference in height between the tea plantation and the house by analyzing the 1978 and 2010 topographical maps. We confirmed the distribution of tea plantations in 2010 and the land that existed as tea plantations in 1978 through fieldwork.

Results

Tea plantations increased from 27 to 31 sheets between 1978 and 2010 (Fig. 3-4).

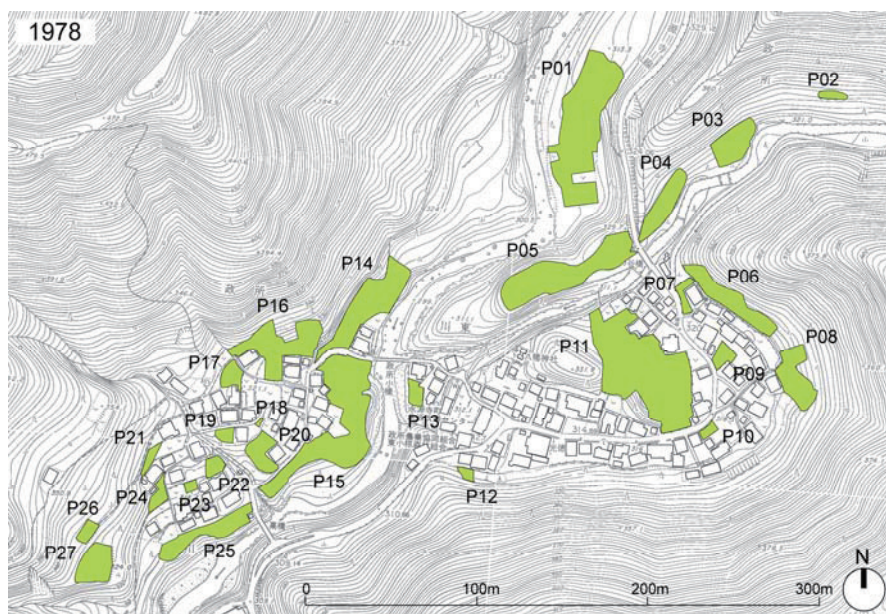


Fig. 3: Distribution of tea plantations in 1978.

(This topographical map was made by the Eigenji municipal government in 1978.)

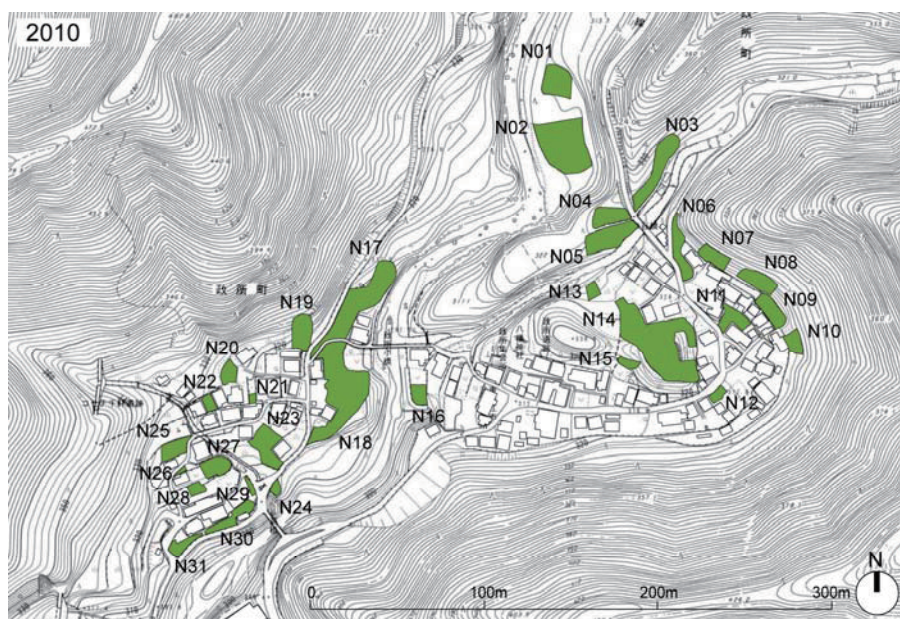


Fig. 4: Distribution of tea plantations in 2010.

(This topographical map was made by the Higashiomi municipal government in 2009.)

In 1978, the largest area of a tea plantation was 2,424 square meters, the average area was as 505 square meters in 1978. The largest area of a tea plantation was 1,138 square meters, the average area was 227 square meters in 2010 (Fig. 5). Therefore, the average area in 2010 was approximately half of that in 1978.

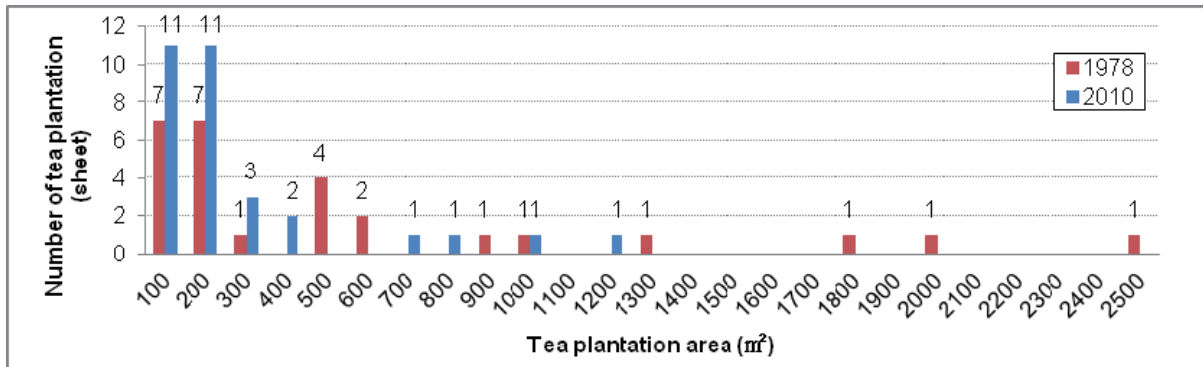


Fig. 5: Chart of tea plantation area.

The average slope angle in 1978 was 19°, whereas in 2010 it was 15° (Fig. 6).

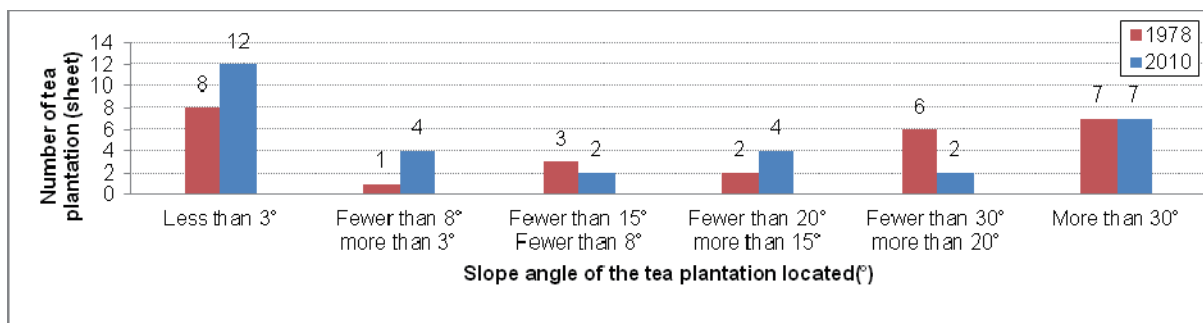


Fig. 6: Slope angle of the tea plantations present in 1978 and 2010.

Southeast was the most prominent azimuth direction in both 1978 and 2010 (Fig. 7).

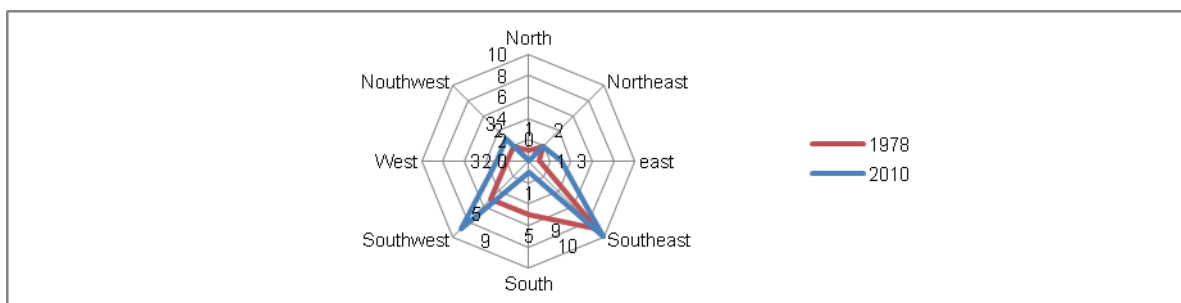


Fig. 7: Chart of azimuth direction of slope.

The altitude of the tea plantation parcels in 1978 was 300-339 m, whereas it was 302-332 m in 2010. Five types of transformations in tea plantations have been observed (Table. 1). First is the fragmentation type in which one parcel splits into many parcels. The disappearance type is a parcel that existed in 1978 and disappeared in 2010. The reduction type is a parcel that decreased in area over the years. In contrast, the expansion type is a parcel that increased in area over the years. The new generation type is a parcel that is newly confirmed in 2010.

Table.1: Types of transformations that were observed in the tea plantations.

Transformation type of tea plantation	Number of tea plantation (sheet)
Fragmentation	6
Disappearance	9
Reduction	8
Expansion	4
New generation	6

Places where a tea plantation existed in 1978 but has been transformed into another land use included vegetable gardens, grass-lands, coniferous forests, broadleaf forests, built-up areas, and roads or revetments in 2010 (Fig. 8).

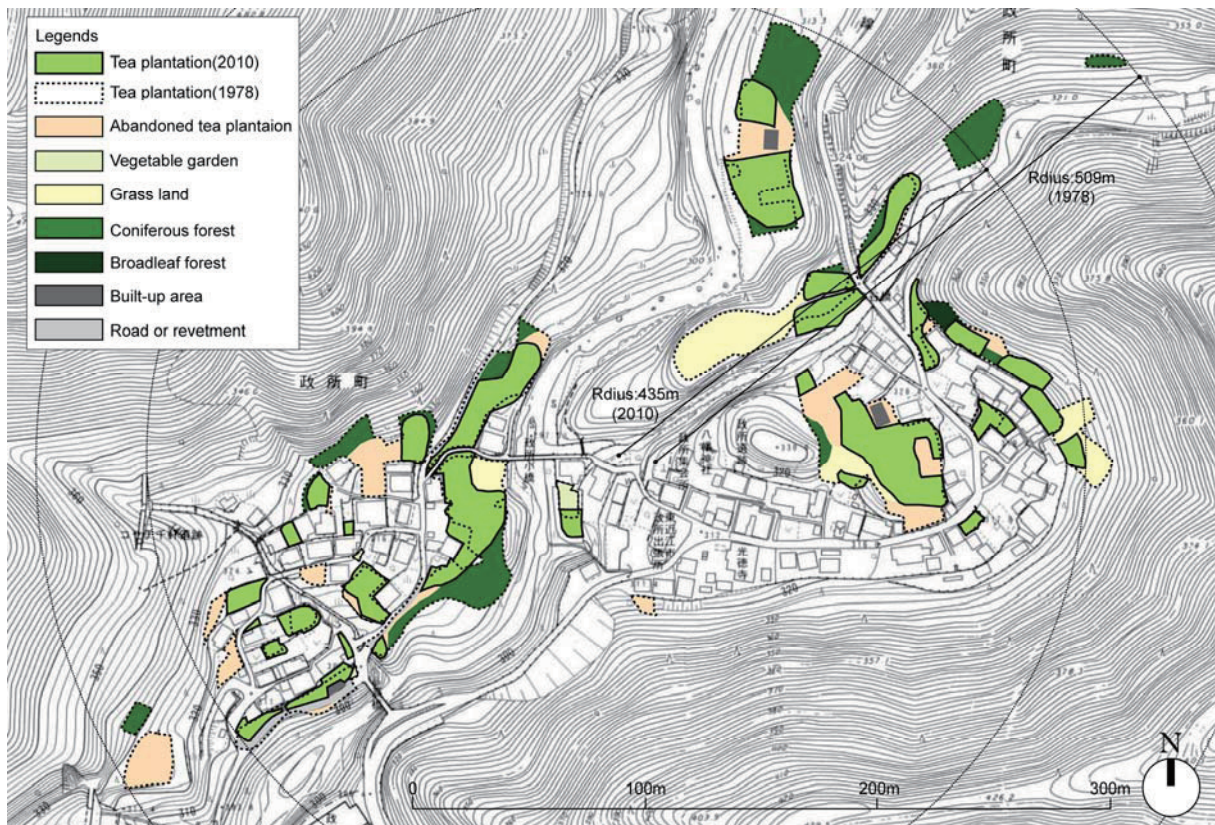


Fig. 8: Land use in 2010 of where was tea plantation in 1978.

Discussion

Many tea plantations are distributed on the inside and outside of the southern slope near the village. The number of tea plantations has increased, but the average area has been halved from 1978 to 2010. The radius of the distribution range has been reduced from 535 m and 409 m. Therefore, it is thought that each tea plantation has shrunk.

All parcels having an area of 1200 square meter or more in 1978 have fragmented (Fig. 9). Cultivating a tea plantation requires a significant amount of manual labor for activities such as untangling the whips of tea trees, applying fertilize, weeding, and harvesting each tea tree. Therefore, it is thought that a shortage of manual labor as a result of depopulation and aging has caused a reduction in the scale of tea plantations.

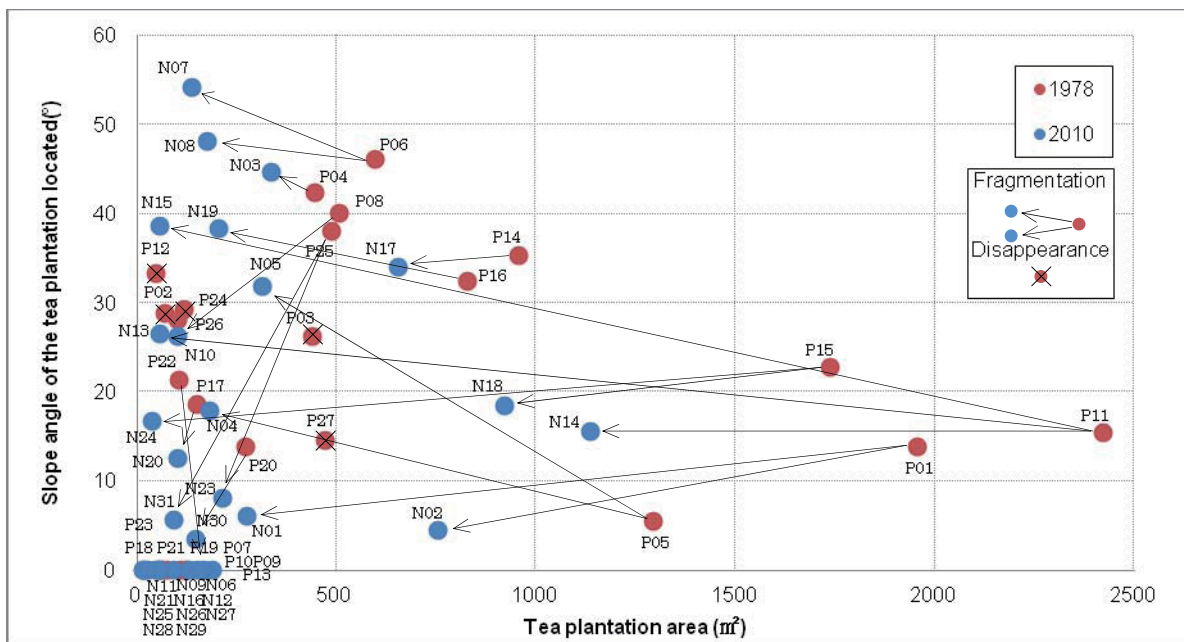


Fig. 9: Area and slope angle of tea plantation present in 1978 and 2010. (The numbers in this chart correspond to those in Fig. 3-4.)

Because tea plantations require managed maintenance activities on a daily basis, the physical relationship between the tea plantation and the house is important. Parcels in which the distance between the tea plantation and the house was 40 m or more have been transformed into the fragmented type or have disappeared. Furthermore, parcels in which the difference in height between the tea plantation and the house was 10 m or more have disappeared (Fig. 10). Therefore, it is thought that parcels located farther away from the house have been transformed, which is consistent with fact such as the narrowing of dimensions and reduction in the distribution range.

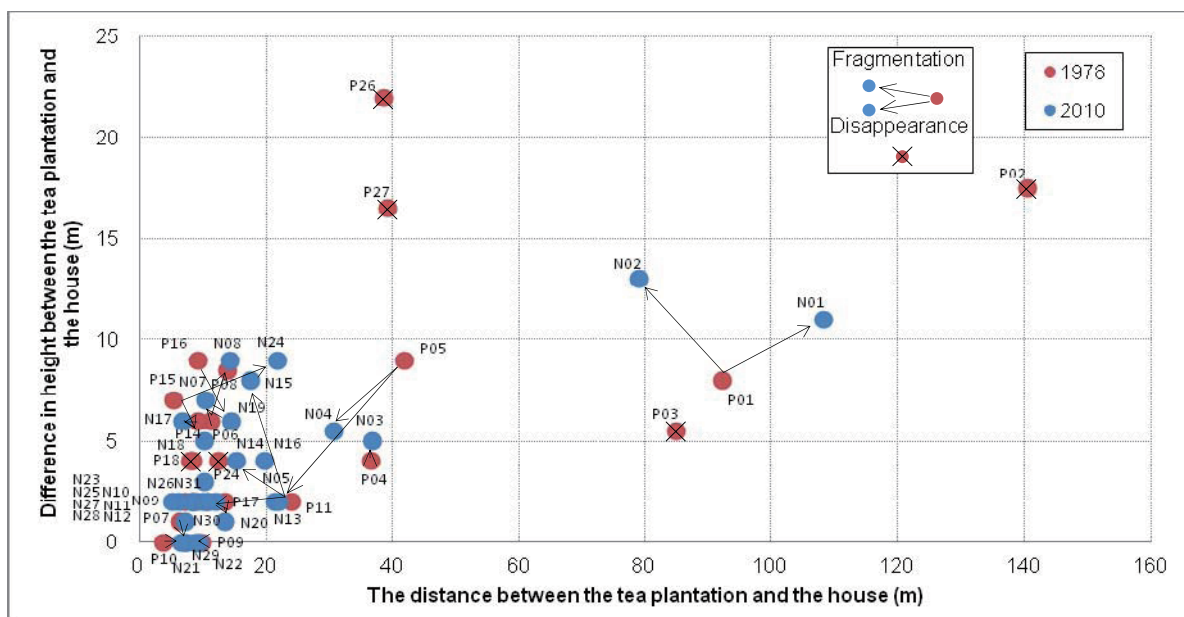


Fig. 10: Distance and difference in height between the house and tea plantation in 1978 and 2010. (The numbers in this chart correspond to those in Fig. 3-4.)

Locations where a tea plantation existed in 1978 have mainly been abandoned, and have become grass-lands and coniferous forests (Fig. 11). Currently, the grass-lands are used to obtain grass for fertilizer in the region near the house and the coniferous forests have been diverted from tea plantations by the afforestation program. It is thought that the transformation process of tea plantations has been affected by the change of bread-and-butter job, transportation, methods of cultivation, and age demographics.

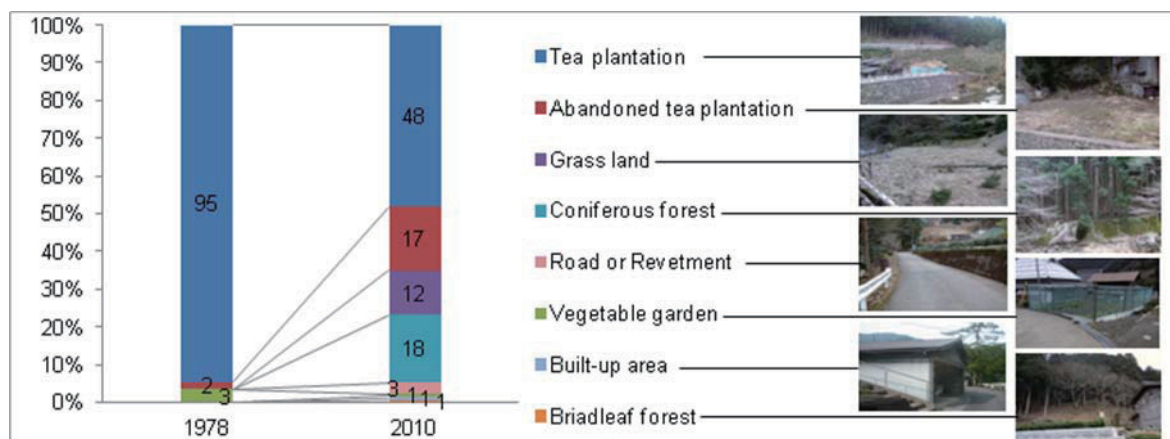


Fig. 11: Chat of percentage of land use

Conclusion

We determined that both the area of distribution and the size of tea plantations have decreased. Parcels that were located in places inaccessible to elders and large-scale tea plantations have fragmented or disappeared. The transformation of tea plantations has been affected by the change in human agency.

Depopulation and aging have progressed gradually in the mountainous region, indicating change in lifestyles of people in the mountainous region, furthermore affecting the disappearance of tea plantations. Therefore, we suggest that maintenance measures for tea plantations should be performed for the upkeep the cultural landscape in the mountainous region.

Note

1. "Yabukita" is the breed of tea tree most often cultivated in Japan. "Yamacha" comprises about 90% of the tea trees cultivated in Japan.
2. "Yamacha" is a breed of tea tree that was cultivated in many villages of Japan in the past. It has said that Yamacha grew naturally in the mountainous region. People used it to carried on tea industry.

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