
Multiple cropping systems in uplands of central Japan

Kazutoshi Hoshikawa
*Faculty of Agriculture,
Shinshu University,
Nagano 384-4598, Japan*

Introduction

Japan is a mountainous country, with 70% of its land area covered by a hilly terrain compared to 30% area covered by valley land. Most of the area experiences temperate humid monsoon climate. Valley lands are under wet/irrigated paddy cultivation. This irrigated system has benefited from modern scientific and technological innovations that have enabled stable and high productivity. Industrialization and urbanization have also rapidly progressed in valley land use. Agriculture has continued in hilly areas for many years, but on a small scale. Massive efforts are required to overcome

constraints in farming due to steep topography and severe weather conditions. Japanese agriculture is a small scale labor intensive land use and its efficiency is not as high as in many other countries. Agricultural land use in Japan has declined over the past half century, leading to a drastic reduction in number of farmers and increase in area of abandoned farmland. These trends are more marked in hilly regions compared to the valley lands in the country.

Abandonment of agriculture land use is an important aspect of environmental degradation. Knowledge on traditional agricultural practices continuing in mountains since historical times could be useful in overcoming some of the present problems. This article shows that traditional upland agriculture in Japan, to a significant extent, has taken care of sustainable use and conservation of natural resources together with the human food needs.

Study area

A typical small agricultural settlement, Shimoguri, located on southern slope in Akaishi mountain ranges, was selected for this research. Shimoguri is a settlement of Kami-mura village in the district of Shimoina towards the southern end of Nagano Prefecture (Figure 1). The whole district including Kami-mura and vicinity is called Toyama-gou. One of the most secluded districts in Japan, it is located on the boundaries of Aichi and Shizuoka Prefectures. Since Toyama-gou forms the valley of an enclosed system surrounded by high mountains, it has been left behind in terms of development of modern transportation network.



Figure 1. Study area and surroundings

Shimoguri is located at an altitude of 900 m to 1100 m. As in year 2000, there are 56 households and 112 inhabitants in this settlement. Farmers have continued small scale agriculture sustained with locally available resources. Almost all houses of this settlement are on south slope. Most farm fields are on 25 to 40° slopes where wet paddy cultivation and use of agricultural machinery are practically impossible (Figure 2). Multiple cropping is common.

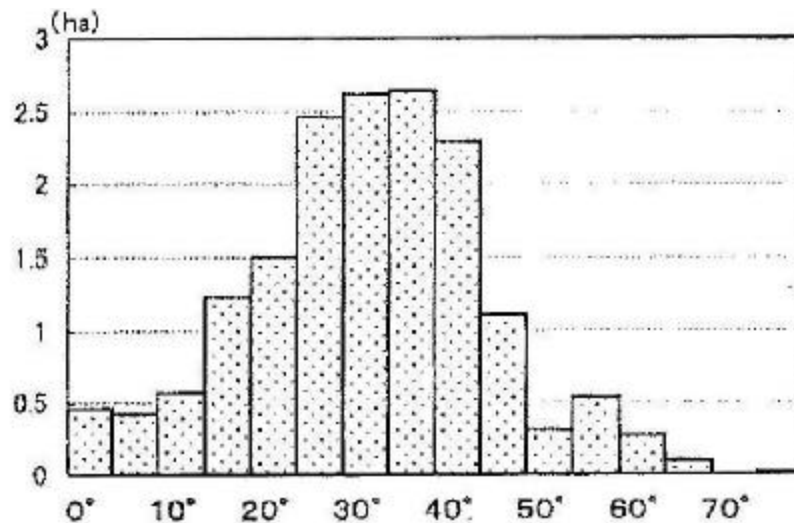


Figure 2. Inclination of farmland in study area

Geographical distribution of land inclination is shown in Figure 3. Landform is such that rates of soil erosion may be alarming in the absence of proper management. Long term sustenance of agriculture demands prevention of soil erosion and outflow of topsoil. Figure 4 shows seasonal variations in daily maximum, minimum and average temperature of air (at 1.8 m above ground surface), soil surface and at 5 cm soil depth. Annual average temperature is close to 10°C. It is comparatively warm except in mid-winter. Temperature can be as low as -10°C on several days in winter.

Multiple cropping system

Each farm house cultivated over an area of 21.5 acres. There are no wet paddy fields. Food grain, vegetable, and fruit tree crops are intermixed in small fields all across the village. More than 50

different crops may be grown on a farm. The traditional crops, such as Japanese millet and foxtail millet have been contributed to the preservation of these precious genetic resources. Tea is also grown in Shimoguri. Table 1 gives growth period of different crops on a sample farm. Intensive agricultural land use on a sample farm is shown in Figure 5. Crop diversity is so high and crops are managed such that soil is always covered.

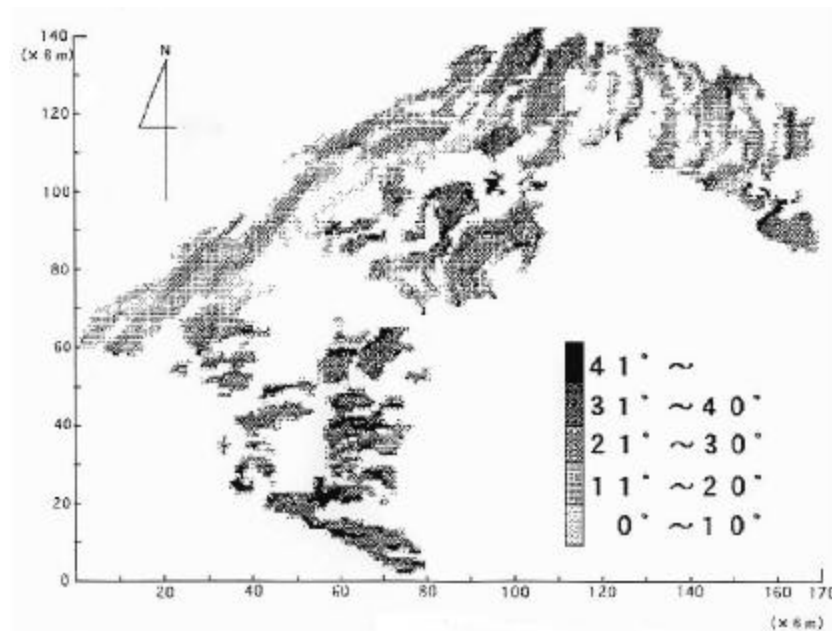


Figure 3. Distribution of inclinations

Environment, farming and local skills

By practicing agriculture on southern aspect, farmers tend to reduce the limitations arising from low temperatures. Some crops can survive even during winter, as temperature near ground surface never falls below 0°C . To improve environment and stabilize agriculture, farmers have pooled their wisdom and skills. Selection of crops with ability to grow at low temperature and keeping the ground warm by covering soil with leaf litter are some examples of traditional wisdom. Although tea is generally picked several times in a warm district, only the first sprouts can be gathered in Shimoguri.

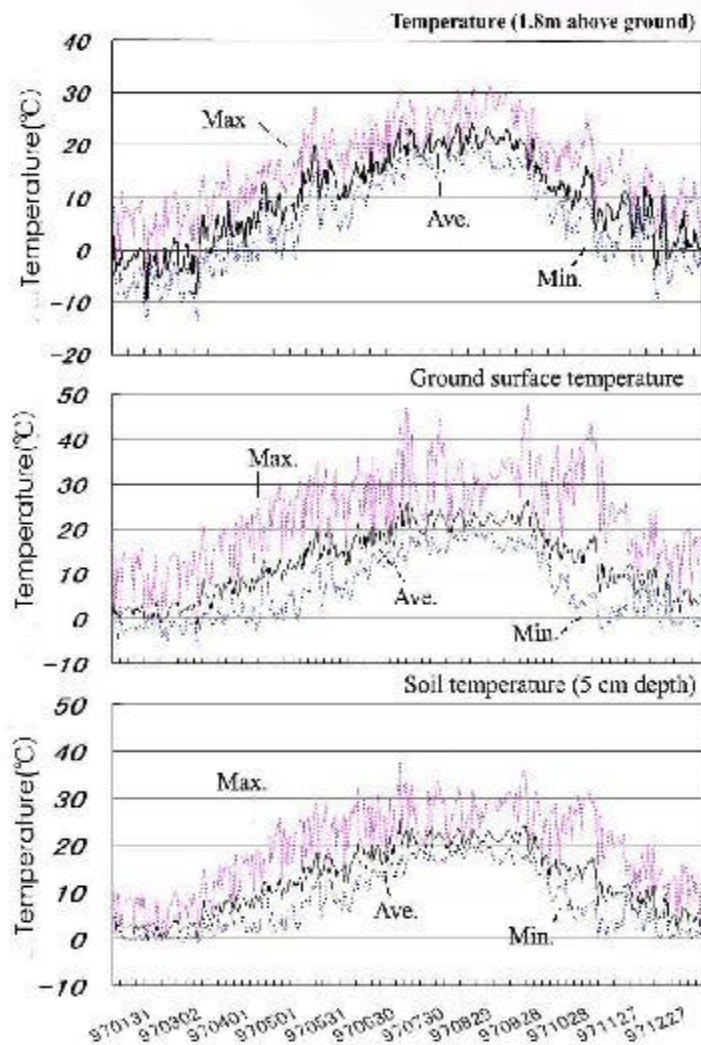


Figure 4. Temperature variations in shimoguri

Since farmland in Shimoguri is on steep slopes, soil erosion easily occurs, and heavy rains make it all the worse. In order to sustain agriculture on steep slopes, prevention of soil erosion and outflow of topsoil has been a key concern in traditional management. Half of the soil consists of relatively large pebbles with a diameter of 1 mm or more, while the remaining half consists of fine particles with a well developed structure. It is assumed that large pebbles

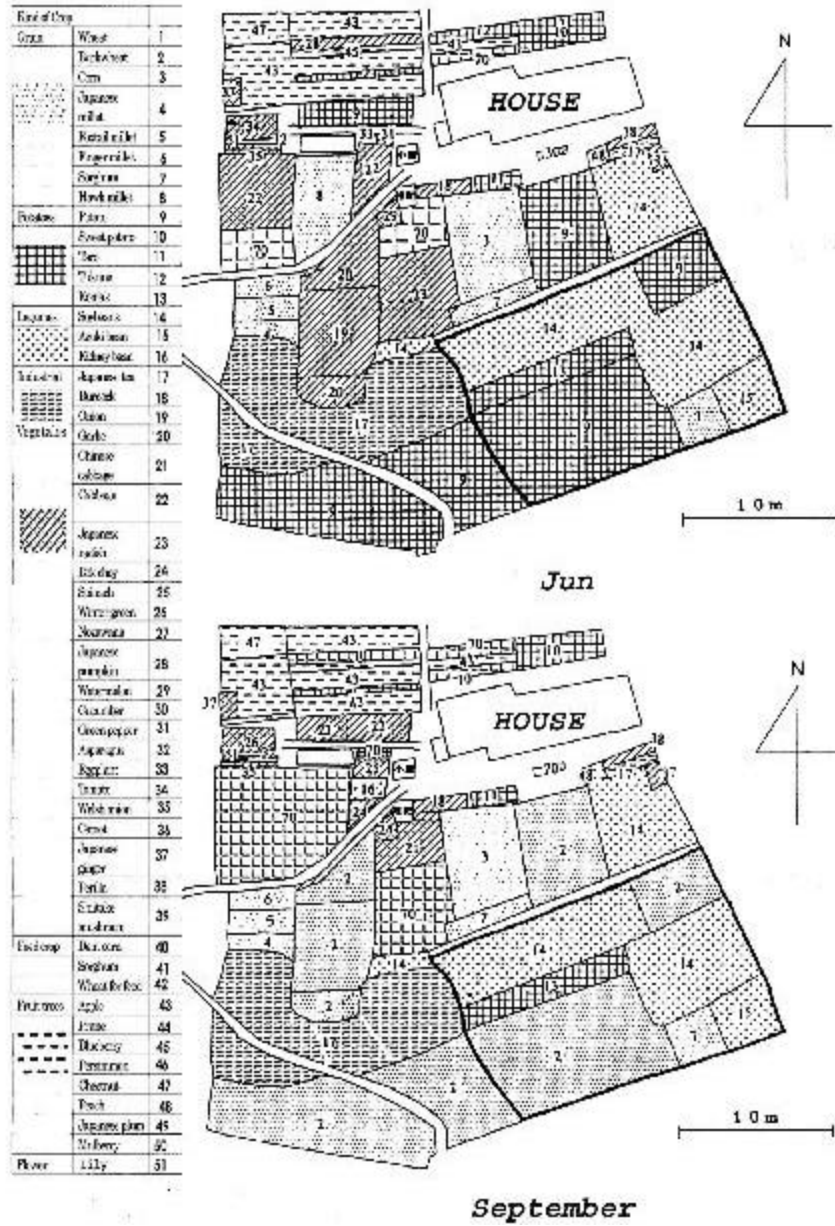


Figure 5. Map of land use in sample

decrease the impact of raindrops and help protect against soil erosion. Farmers frequently use various organic residues and compost for reducing soil loss and maintaining soil fertility.

There are also various distinctive recipes for agricultural products. For example, the tradition of old gastronomic culture, such as *dengaku* from potato, bean paste containing *Perilla*, and buckwheat cakes of salty Pacific saury, still alive in Shimoguri. The usage of various wild nuts and fruits collected from the surrounding mountains adds a characteristic local note. The survival of the unique gastronomic culture of this area depends on the peculiarities of the local agriculture, with which it is tightly connected.

Conclusions

Agriculture in Shimoguri has been dependent exclusively on traditional knowledge and skills. From the viewpoint of efficiency and productivity, multiple cropping may appear rather primitive when compared with modern monocultures. However, it is clear that the traditional agriculture has been stable over a long period of time. Skills of crop and land management have been handed down from generation to generation. At present, society is rapidly aging in Shimoguri. The younger generations are moving away from labor intensive land use and getting more and more attracted to off-farm means of livelihood. Several programs have been implemented for development of mountain villages but their impacts are limited. It is important to create new mountain development models based on traditional skills and wisdom enhancing local livelihoods together with conservation of natural resources.

Reference

Institute of Mountain Sciences, Shinshu University 2003. *Practical Use of Mountains and Villages*, Shinano-Mainiti Press, (in Japanese).