Multiple Cropping System of Mountain-Slope Agriculture in the Central Part of Japan

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- Experience in Monsoon Asia -
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  Present conditions of landuse in mountainous region.

☑ Study area and method
  Observation of environment and crop farming in study area.

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☑ Summary
Background (1)

- **Topographical and meteorological conditions**
  - Mountainous country with complex topography
  - Humid monsoon climate with four seasons

- **Agricultural land-use in mountainous region**
  - Small in scale, labor intensive and low efficiency

  **Reduction in the number of farmers**
  **Increase in an abandoned farmland**
Background (2)

- Not only the abandonment of farmland but also village communities have been simply disappearing as inhabitants grow older.
- The surrounding abandoned farmlands face the crisis of environmental destruction.

- To obtain knowledge of traditional agriculture, which has utilized the mountain environment and has harmonized with the condition.
- To clarify the role and effect of mountain agriculture on environmental conservation and land management.
Study area

- Located on the southern slope in the Akaishi mountain ranges
- Valley of an enclosed system surrounded by the high mountains

Kami-mura

Shimoguri
Shimoguri: Be reaching up toward the heavens
Outline of Shimoguri

✓ Typical small agricultural settlement in Kami-mura, the southern end of Nagano
✓ Altitude (m) : 890 ~ 1,100
✓ Temperature (°C) : Yearly average 10, max : 31, min: -14
✓ Precipitation (mm) : 1900 ~2100
✓ 58 households and 78 inhabitants (1998)
✓ Upland cultivation (No paddy and non use of machinery)
✓ Acreage of cultivation by each farmhouse (a) : 21.5
✓ Average incline of farmland (deg.): 30
Harsh environmental conditions

Frequent occurrence of a landslide

Multiple-cropping on the slopes
Multiple Cropping System of Mountain-Slope Agriculture
Some results of observation

1. Topographical conditions
2. Meteorological conditions
3. Crop farming
-Topographical conditions -

Fig. 3 Geographical distribution of land inclination

Soil erosion and Runoff of topsoil
### - Meteorological conditions -

#### Table 1. Variations of air temperature

(Unit: °C observed hourly at 1998)

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<th>Daily</th>
<th>Hourly</th>
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<tr>
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<tr>
<td></td>
<td>31.3</td>
<td>-13.5</td>
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</table>
Multiple cropping system of mountain-slope agriculture

Table 2. Kind of and cultivation period of a cultivated crop

|--------------|-------|-------------|------|-----------------|---------------|--------------|-----------|------------|----------|----------|-------------|------|----------|--------|---------|----------|-----------|-------------|------------|----------------|---------|----------------|--------|----------------|--------|----------------|---------|-------------|---------|---------------|----------|
Land use map of sample farm

Wide varieties are grown densely in every location

Intensive agricultural land use

Fig. 5 Map of land use in sample farm
Three features of the agriculture in Shimoguri

- Small-scale, self-sustaining agriculture
- Upland agriculture using slope fields
- Multiple-cropping agriculture
Relationships among environment, crop farming and local skills
Relation among topography, climate and crop farming

The temperature near the ground surface almost never falls below zero degree.

Fig. 4 Variations of various temperatures in Shimoguri
Cumulative wisdom and skilled techniques to improve the environment and stabilize crop production

- Selection of winter crops that grow at low temperature.
- Preservation and use of traditional crops.
- Keeping crop-rotation.
- Adjustment of sowing and harvest time.
- Keeping the ground warm by covering the soil surface with fallen leaves, plants.
A special harvesting method is used for cultivation of tea

Dead leaves and sprouts of tea plats
Relation among soil properties and land management
Soil properties and soil conservation

The comparatively large pebbles with gravel mixed in the soil.

Half of the soil: large pebbles with a diameter of 1 mm or more

The remaining half: fine gravel particles with a well-developed structure.
Special soil properties

The large pebbles component decrease the impact of raindrops and help protect against soil erosion.

The remaining fine component make a well-structured and fertile soil.
Wisdom and skills for soil conservation and land management

- Choosing a kind of crop according to topographical and soil conditions.
- Keeping crop-rotation.
- Protection of soil erosion by covering the soil surface with fallen leaves and the plants body.
- Use of various organic fertilizers: leaves, plants, compost.
- Plowing in the grasses and brushwood.
- Contour furrowing and farming.
- Development of own plowing method: “Sakasa Unai”.
- Installation of the materials which prevents soil erosion.
Contour furrowing and farming

Installation of the materials which prevents soil erosion.

Use of various organic fertilizers
Contour furrowing and farming.

Digging of small pits.
Crop consumption: gastronomic culture

- Various distinctive recipes for agricultural products.
  - *Dengaku* from potato
  - Bean paste containing *Perilla*
  - Buckwheat cakes of salty Pacific saury,

*Tradition of old gastronomic culture*
Potato baked and coated with miso
(Imo Dengaku)
Agricultural techniques on multiple cropping system

✓ Simple and small scale.
✓ Various and numerous skills of crop and land management have been handed down.
✓ Traditional skills and farmer’s lifestyles have been intertwined in the study area.
✓ These compound and integrated skills have a huge role in the conservation of mountain biological resources and land management.
Relationship among environment, skill and crop production

- Harsh environment
- Hard winter
- Use of mountain weather
- Mountain resources
- Steep slope
- Small-scale field
- Special soil properties
- Skills for soil conservation
- Skills to improve crop environment
- Skills to stabilize production
- Agricultural land use: Crop farming, Land management
- Multiple crop production
- Gastronomic culture (self-consumption, self-sufficiency)
- Livestock
Multiple material-recycling system

Mountain: closed system
Harsh environment
Natural resources

Farmland

Land management

Land use

Crop farming

Production

Traditional skills

Gastronomic culture

Community (self-sufficient system)

Organic matter

Crops
Summary: Fundamental wisdom in the agriculture of Shimoguri

1. Small-scale, self-sufficient organization based on multiple crop production.
2. Establishment of multiple material-recycling system making the most of local skills relating to the environment, land use, agricultural production and food consumption.
3. Inheriting and maintaining locally developed agricultural skills and gastronomic culture suitable to the area.
4. Acquisition of knowledge relating to environmental conservation of mountains and farmlands through multiple crop farming system.
A small mountain village like Shimoguri indeed mirrors the fundamental paradigm which connects nature and human life.
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