

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

International Symposium

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Natural Resources Management in Marginal Areas

- Experience in Monsoon Asia -
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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



Multiple Cropping System of Mountain-Slope
Agriculture

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







Some results of observation

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

-Topographical conditions -

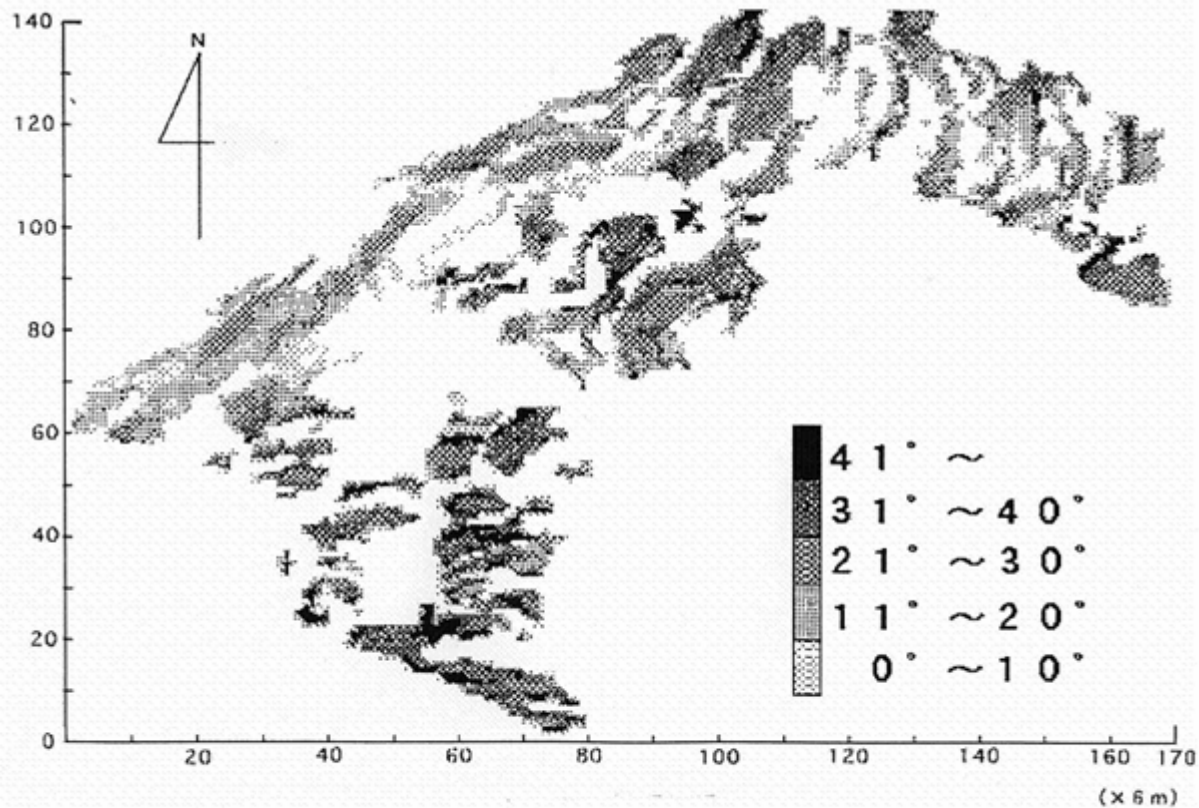
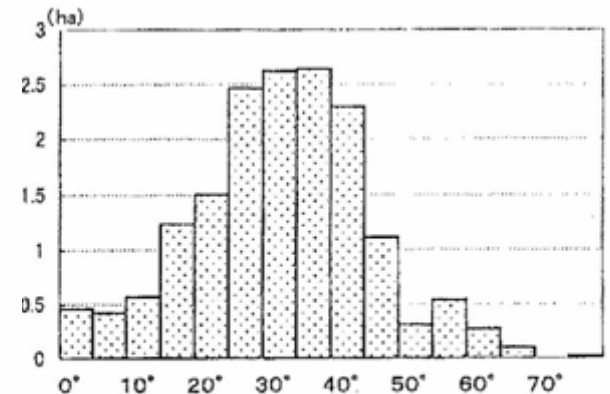


Fig. 3 Geographical distribution of land inclination



J. 2 Inclination of farmland

Soil erosion and
Runoff of topsoil

- Meteorological conditions -

Table 1. Variations of air temperature

(Unit: °C observed hourly at 1998)

Yearly mean	Daily		Hourly	
	Max	Min	Max	Min
10.1	24.3	-9.5	31.3	-13.5

Kind and cultivation period of cultivated crop on sample farm

Multiple cropping farm

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

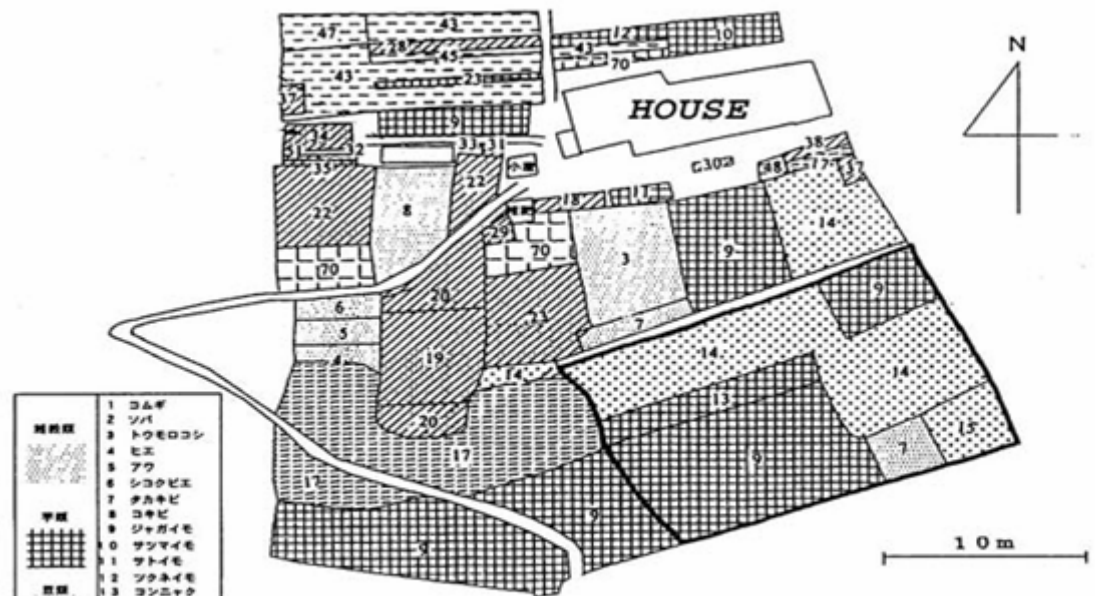
Kind of Crop		MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Grain	Wheat	→											
	Buckwheat												
	Corn												
	Japanese millet												
	Foxtail millet												
Potatoes	Finger millet												
	Sorghum												
	Hawk millet												
	Potato												
	Sweet potato												
Legumes	Taro												
	Takuan												
	Kongjak												
	Soybeans												
	Azuki bean												
Industrial	Kidney bean												
	Japanese tea												
	Burdock												
	Onion												
	Garlic												
	Chinese cabbage												
	Cabbage												
	Japanese radish												
	Bok choy												
	Spinach												
	Winter green												
	Nozawana												
	Japanese pumpkin												
	Watermelon												
	Cucumber												
Green pepper													
Asparagus													
Eggplant													
Tomato													
Welsh onion													
Carrot													
Japanese ginger													
Perilla													
Shiitake mushroom													
Feed crop	Dent corn												
	Sorghum												
	Wheat for feed												
Fruit trees	Apple												
	Prune												
	Blueberry												
	Persimmon												
	Chestnut												
	Peach												
	Japanese plum												
Flower	Mulberry												
	Yuri												

Sowing/Planting → Harvest

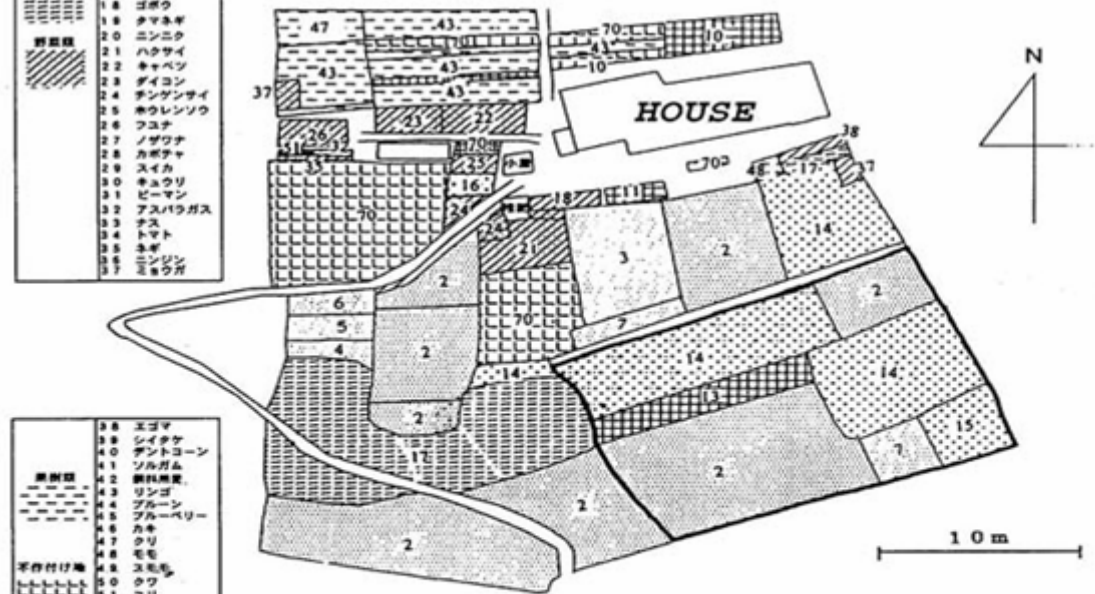
Land use map of sample farm

Wide varieties are grown densely in every location

Intensive agricultural landuse



Case of Jun



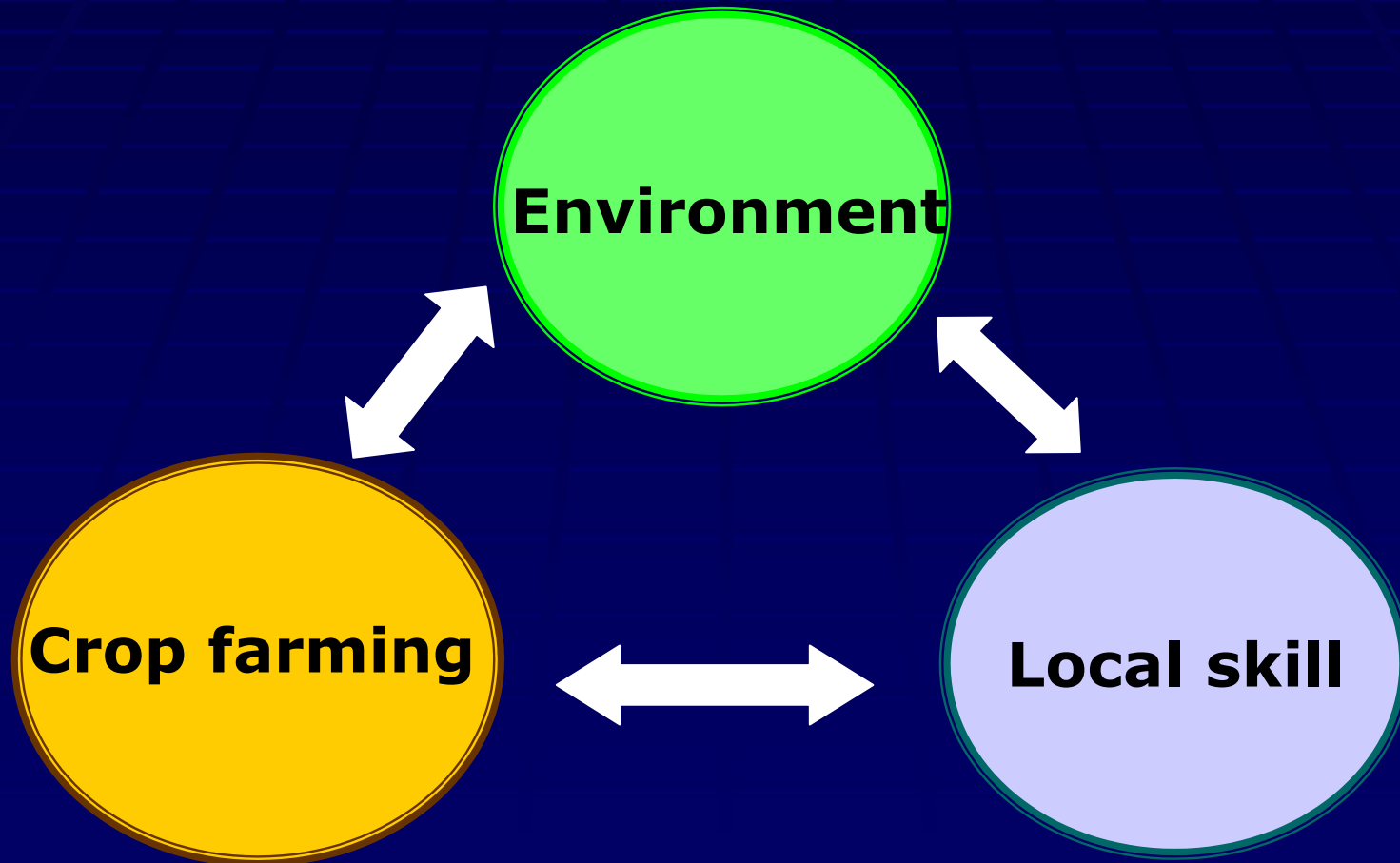
Case of September

Fig. 5 Map of land use in sample farm

Three features of the agriculture in Shimoguri

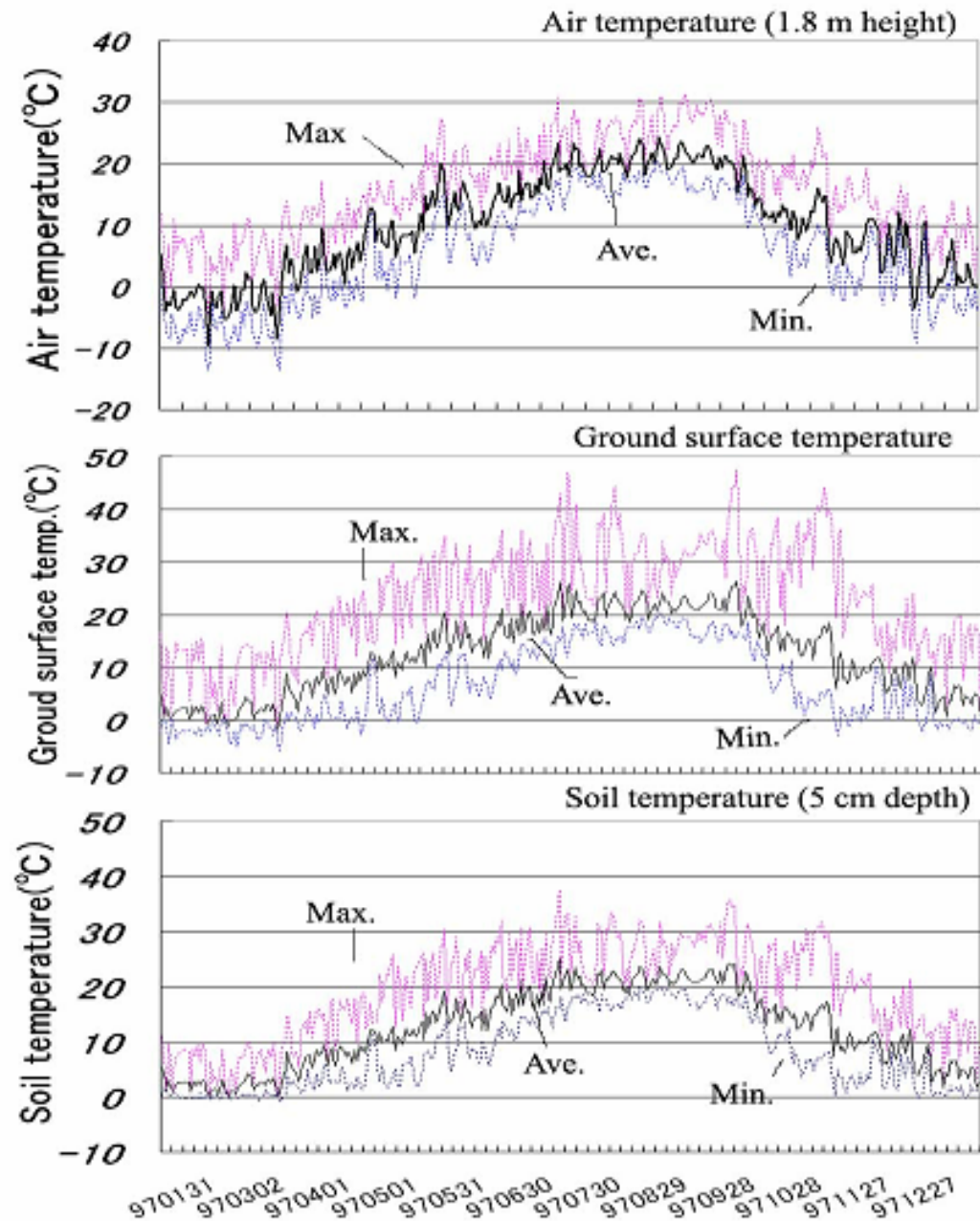
- ✓ **Small-scale, self-sustaining agriculture**
- ✓ **Upland agriculture using slope fields**
- ✓ **Multiple-cropping agriculture**

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.



Multipl

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 plants

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

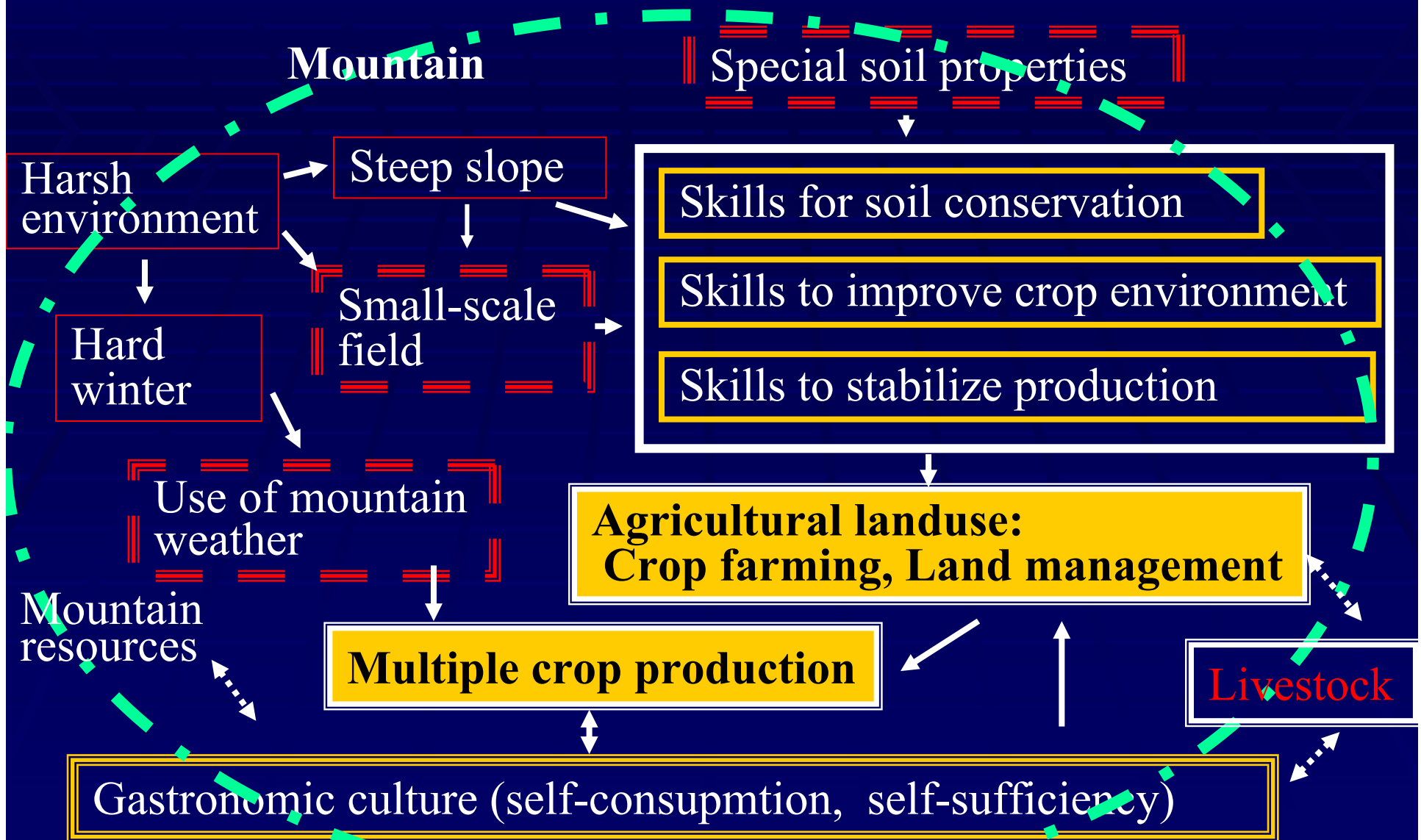


Potato baked and coated with miso
(Imo Dengaku)

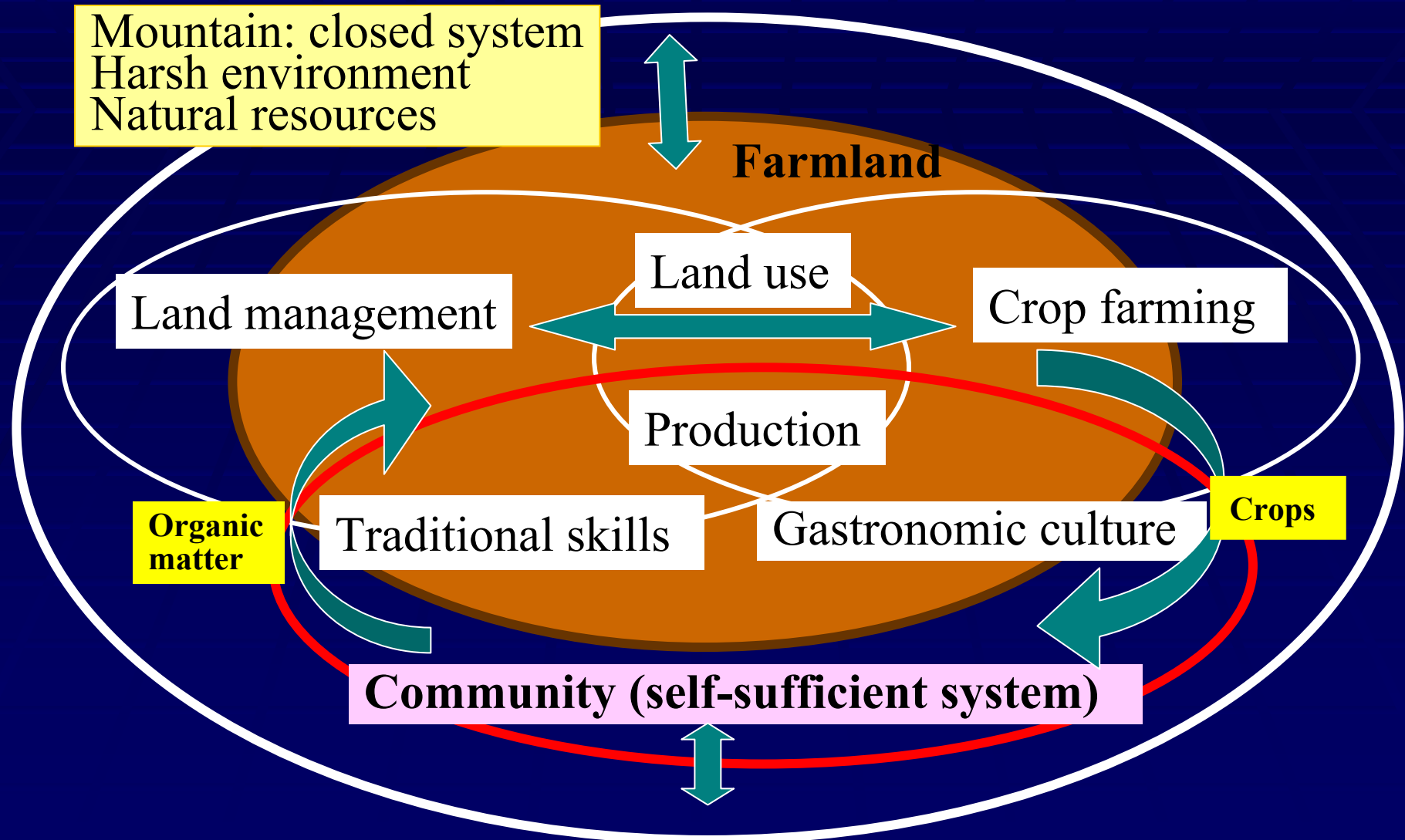
Agricultural techniques on multiple cropping system

- ✓ 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



Multiple material-recycling system



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.

