

Effects of vegetation recovery and rural development by Grain for Green Project in China

SATO, Ren'ya^{1*}

¹Kyushu University

More than 10 years have past since Chinese government started the Grain for Green project in 1999, for recovery of environment mainly in upper and middle catchment areas of Huang He and Chang Jiang. The policy is characterized by aiming at not only environmental recovery by large-scale afforestation in the catchment area but also promoting development of rural economy through land reclamation and promotion of alternative development projects instead of giving up steep slope cultivation among villages conducting the Grain for Green project.

This paper preliminarily reports present conditions of household economy among rural villages in several districts of Yanan City with special references to alternative development projects and its incomes, based on field observation and interviews conducted in August 2011. The result indicates that there are regional differences in the consequences of rural development plans.

Keywords: Grain for Green Project, rural development, Loess Plateau, Shanxi, China

Landuse condition and development of commercial farming in Inner Mongolia, China

SASAKI, Toru^{1*}, Ryohei SEKINE², Sudesiqin³, Yoshinori OTSUKI⁴

¹Sapporo Gakuin University, ²Tohoku University, ³Inner Mongolia University, ⁴Tohoku University

Landuse condition and development of commercial farming in Inner Mongolia, China

Keywords: landuse condition, commercial farming, natural resources, Inner Mongolia

Land rehabilitation methods based on the refuse input: local practices of Hausa farmers in the Sahel, West Africa

OYAMA, Shuichi^{1*}

¹Graduate School of Asian and African Area Studies, Kyoto Univ.

To develop the land rehabilitation methods in Sahel of West Africa, it is necessary to examine the indigenous knowledge and daily practice against desertification. In order to avoid the land degradation and crop failure problems, the Hausa farmers in Niger carry refuse as manure from their homestead into the degraded land of the millet fields. This degraded land is cemented and strongly acidic with poor nutrition and produces no plants or crops. The content of refuse is mainly organic materials such as plant residue and livestock excreta, and it can provide abundant N, C, P and nutritional salts with weak alkalinity.

The author carried out the in situ experiment and put urban trash of 0 kg/m² (plot 1), 5 kg/m² (plot2), 10 kg/m² (plot 3), 20 kg/m² (plot 4) and 45 kg/m² (plot 5) on the degraded solid sedimentary layer. After one year of trash input, the regenerated plant growth was 16 species of 2.6g/ m² on plot 2, 16 species of 33.4 g/ m² on plot 3, 35 species of 496.2 g/ m² on plot 4 and 17 species of 365.4 g/ m² on plot 5, although there was no plant growth on the degraded land of plot 1. According to the field observation, the termites drilled tunnels under the trash and carried up silt and clay from the underground for building their shelters over the organic matter. The rainwater percolated into the ground through the termite tunnels of the cemented sedimentary layer, in spite of flowing away on the sedimentary layer.

Refuse input increased soil porosity as well as termite activity, which promoted moisture retention as well as penetration. The rises of the trash were able to catch the wind-blown sand as well as organic materials provided by sandstorm, and to disperse rainwater running off on the ground. These wind-blown sand, and clay and silt lifted up by the termites were important for improving soil physical property for the millet cultivation. The trash on the cemented sedimentary layer prevented from soil erosion and exposure of the cemented sedimentary layer. refuse input of 20 kg/m² remarkably improve soil moisture for only the first year as well, whereas land degradation afterwards was somewhat slower.

The Hausa farmer and the Fulbe nomad interviewed for the experiment also agreed that the refuse amount at 20 kg/m² scattered over Plot 4 was effective in preparing pearl millet fields and grazing grounds. Because the Sahel area has seen rapid population growth, and land use pressure by both cultivators and pastoralists are high, it is critical that degraded land is rehabilitated for new fields and grazing grounds. The critical amount of urban refuse was at least 20 kg/m². However, the improved soil property deteriorated after two years due to depletion of nutrients through termite activity, grazing, and utilization by people, and sand grain erosion from wind and rain. Land degradation was greater with sloped topography with more soil erosion. In order to maintain plant productivity recovered using urban refuse, it is necessary for continuous input of refuse to compensate for nutrient depletion from wind and rain erosion.

Keywords: Sahel, land degradation, desertification, revegetation, termite, urban refuse

Tree management in the coping strategies of Hausa cultivators for the drought and land degradation in Sahelian Niger, We

KIRIKOSHI, Hitomi^{1*}

¹ASAFAS, Kyoto University

The land degradation problem and drought bring about crop failure, food shortages and malnutrition to the people in the Sahel region, West Africa. Although the production of the millet cultivation and livestock grazing is limited by the severe aridity and poor soil nutrition, we recognize the rapid population increase, the expansion of the cultivation and the grazing, and deforestation. In Sahel region, the rain-fed agriculture was dominant and the crop yields are strongly depended on rainfall variation. The Hausa cultivators in Sahel region of Niger faced the ecological vulnerability of land degradation and rainfall variation of the unexpected drought and rainfall abundance. This study focused on their coping strategies for ecological vulnerabilities of rainfall variation and land degradation with their ecological knowledge to the tree management.

Hausa people recognize the tree forms by eyesight and classify four categories of tree forms: *mayanchi*, *matashi*, *rabu* and *barau*. *Mayanchi* indicates trees with about 3 m height and one or two trunks. *Matashi* indicates small trees, with cutting lower branches. *Rabu* indicates small saplings, less than a year old without cutting lower branches. *Barau* indicates over two year old trees without cutting branches. *Mayanchi* provide shade, livestock fodder, and food for people. *Matashi* is excellent at catching sand, which is easily lost by water and wind erosion. *Rabu* and *barau* is used for avoiding land degradation and catching sand. The farmland owners manage the tree location and density, and simultaneously tree forms in the millet field, by judging the field condition and household economy. Trees play important roles for avoiding food insecurity from drought and rainfall variation as well as soil fertility decline, soil erosion, and depletion of fodder during long term dry season.

The landowners have ownership for the trees within their own farmland and utilize trees with their own aims. During rainy season, the tree use is strongly limited by the landowners. The residents are willing to avoid the crop damage by cutting branches and they are not permitted to use trees in the other households' farmland. During the dry season, the natural resources are open to all the residents in the village and they are able to utilize the trees without cutting down trees. In order to sustain their life, they can collect livestock fodder and famine food from all the farmland in the village. *Faidherbia albida* provide important livestock fodder and *Balanites aegyptiaca* provide famine food for the residents during the hunger season. The rich households, called *mai-kudi* in Hausa language own the wider millet fields and provide the livestock fodder and famine food by leaving the trees in their farmland. Although the economic differentials are expanding rapidly in the village, we can recognize the tree use in the farmland as a mode of moral economy at the inside of the village for coping with the severe environmental changes in Sahelian region.

Keywords: tree management, land degradation, moral economy, Sahel, Niger

Agricultural development on subtropical island ecosystem in Okinawa

NAGATA, Junji^{1*}, ARAI, Sachiho W.²

¹The University of Tokyo, ²Tokyo University of Agriculture and Technology

Okinawa, the southernmost part of Japan, was reverted to Japanese administration in 1972 from the United States military administration. With this as a turning point intensified was the government intervention in agriculture of Okinawa. Along with the protection policy for sugar industry enhanced, land improvement project was promoted as the basis of modernization of agriculture of Okinawa. The pioneering land improvement project in Ishigaki Island started in the late 1970s including the construction of full-scale irrigation system and farmland consolidation. It has, however, faced up to the fierce objections by farmers since the late 1980s, which makes it hard to complete it. The objective of this study is to secure the better understandings of this confusing phenomena and to derive policy implications from analyzing what the project has brought to farm managements in Ishigaki Island, paying due attention to the farmers' experiences, learning and evaluations as the project goes on. While short-term effects of increasing productivity brought by land improvement project is unquestionable as to the wet-paddy agriculture in mainland Japan, our analysis showed that, it is not the case in Okinawa where the project mainly targets sugar cane farming; the farmers insufficiently appreciate short-term effects of the projects as follows. 1) The irrigation is not the prominently critical factor affecting the yield of sugar cane. 2) Although the farmland consolidation certainly improved working conditions and accessibility to the field, in the consolidated farmland the negative effect to the yield of crops is observed and especially it is crucial to the cultivation of tropical fruits such as pineapple and mango, one of the promising sectors of agriculture of Okinawa. The result of this study implies continuing the same idea and substance of land improvement project up to now would not lead to the promotion of promising agriculture in the specific physical and social conditions of Okinawa.

Keywords: Okinawa, subtropical region, island ecosystem, agricultural policy, land improvement project, irrigation

The Relationship between the change of Satoyama in Japan and Forest in Southeast Asia: A Case Study of Incense Material

YOKOYAMA, Satoshi^{1*}

¹Nagoya University

In the mountainous areas of mainland Southeast Asia, local residents have actively used various forest resources since old times. In Laos, from the middle of 1990s, people have started to gather one species of tree bulk in response to Thai middlemen of agro-forest products. The tree bulk was *Tabunoki* trees (*Machilus* spp.), which is used as glue for incense such as joss stick and mosquito coils. As natural *Tabunoki* trees are now hard to find in the forest, people are trying to plant it in their land. In Laos, many *Tabunoki* bulks are purchased by foreign middlemen and then sent to China and Japan.

In Japan, originally *Tabunoki* trees were collected from *Satoyama* environment mainly in Western Japan, especially the coastal regions of Kyushu. However, *Satoyama* in Japan had been decreasing its use because of conversion energy from wood and coal to fossil fuel from 1950s. At the same time, conversion of forest species from broad-leaved trees to conifer has been implemented by forest policy in Japanese government. As a result, few locals use *Satoyama* and decrease in production of wood powder made from *Tabunoki* trees.

In this presentation, I would like to focus on *Tabunoki* tree to understand the relationship between forest use in Southeast Asia and forest demand in Japan, and try to clarify the structure of mutual dependence between the regions.

Keywords: forest resource, Satoyama, *Machilus* spp., incense stick, resource chain

Recent forest use and landscape dynamics in a forest located near Lohmar, northwest Germany

SAIJO, KIYOSHI^{1*}, KOHEI HOSHI², MARIE KUBOTA³

¹Miyagi University of Education, ²Undergraduate, Miyagi University of Education, ³Graduate student, University of Bonn

Forest use for fuel and other purposes has come to life again recently in Germany. The observation of a small forest area near Lohmar, a town in the Rhein-Sieg district, in North Rhine-Westphalia, suggests that the forest landscape has been drastically changed in past several years because of forest use and ecological succession. Moor appears after timber felling of artificial conifer forest, and it changes into broadleaf forest by succession or plantation. As a result, artificial conifer forest planted mainly in last part of the 19th century or early in the 20th century for economic purposes is remarkably decreasing. Alternately, broadleaf forest spreads year by year. Moor seems to be a transitional landscape between both types of forest. National policy about forest management and fuel supply resulted in such dynamic change of forest landscape.

Keywords: Forest use, Landscape, Germany

Geomorphic Changes in Agricultural Areas of the Kenyan Tropical Highlands

OTSUKI, Yoshinori^{1*}, Akihiko SASAKI²

¹Graduate School of Science, Tohoku Univ., ²Institute of Mountain Science, Shinshu Univ.

In the Kenyan Central Highlands, higher altitude areas, more than about 2,000 m a.s.l, in the Aberdare (Nyandarua) Mountains and around Mt. Kenya, are situated under the tropical highland climate, where it is relatively cool and the mean annual amounts of rainfall attain more than 1,000 mm. Prominent areas in terms of agricultural productivity were consequently formed in the tropical highlands, whereas considerably active geomorphic changes currently appear, namely, landslide including multiple slump and large-scaled gully erosion occurring on the valley-side to crest slopes on which cultivated sites stand. As we already reported, rapid and accidental mass movements in these areas, mainly landslides, occasionally accompanied with the loss of house and life, have periodicity in several hundreds of years order from the observation and radiocarbon dating of slope deposits.

Our objectives of this study are 1) to summarize the rate of geomorphic change in each landform unit and/or geomorphic process mainly in the tropical highlands, 2) to show the size of micro landforms resulted from the relationships between slope processes (geomorphic processes) and rate of geomorphic changes, and the ease with which the landforms disappear due to cultivation, and 3) to consider how the land environmental condition of cultivated sites should be evaluated by means of micro landforms.

Keywords: Cultivated Site, Land Condition, Rate of Geomorphic Change, Geomorphic Process, Tropical Highlands, Kenya

Lacunarity Analysis of Agricultural Land Cover Image in Northeastern Tanzania

UEDA, Gen^{1*}

¹Graduate School of Environmental Studies, Tohoku University

This study examines land cover/use patterns employing lacunarity analysis as developed in fractal geometry, illuminating their scale (spatial resolution) properties and investigating its applicability to extraction of landscape elements and identification of their size. Lacunarity is an index that is used to quantify homogeneity and texture properties of an image, showing the extent to which the spatial pattern of an image deviates from translational invariance at different scales. In geography and related research fields, lacunarity of various spatial patterns has been analyzed, including drainage systems, soil erosion, tropical forest, urban vegetation and so forth. While a research focus in land cover/use classification is on the improvement in classification accuracy when taking lacunarity into account, there is also room for applying the lacunarity method to investigation on the scale property of an image and the size of its landscape components. Viewing from the latter angle, the study evaluates the capability of total and local lacunarity analyses in the study of agricultural landscape, and of resource distribution patterns in general, applying them to satellite images of agricultural land cover taken in Northeastern Tanzania. It in particular examines the process of land subdivision that is behind the present agricultural landscape in the frontier settlement zone of the mountainous areas in Arusha Region.

Keywords: Local lacunarity, Spatial scale, Agricultural landscape, Tanzania

Gully Erosion and Its Relating Rainfall Events in Agricultural Area, Middle Parts of the Inner Mongolia, China

OTSUKI, Yoshinori^{1*}, Sudesiqin²

¹Graduate School of Science, Tohoku Univ, ²Center for Mongolian Studies, Inner Mongolia Univ., China

In this presentation, we reveal the land environmental condition, in particular, the current condition of gully erosion and its cause, as one of physical environmental resources for agriculture. The Wuchuan County is situated in the north of the Huhhot City, the capital of the Inner Mongolia: The mean annual air temperature and the mean annual precipitation are 2.5 degree Celsius and 354.1 mm, respectively, on the basis of the data from the China Meteorological Administration. Our observations were conducted mainly at two gullies (about 1650-1700 m a.s.l), where the regional low-relief landform is distributed, corresponding to the denudation surface overlain by thin sheetwash deposits.

In this area, the maximum gully-extending rate ranged from 0.25 to more than 1 m/yr between 2003 and 2010. We presume that these gullies started to form in the several hundreds of years ago at least, in consideration of the average yearly extending rate for about 50 years, that is, more than 1 m/yr. From the observation and radiocarbon dating of sheetwash deposits, it is concluded that the area has been subjected to gully erosion resulted from the predominant sheetwash since the mid-Holocene.

It is inferred that the gully erosion in this area is also caused by overland runoff and shallow ground water flow arisen from rainfall, because the noteworthy erosion appears especially in the gully heads and the retreat amounts of gully walls at a short distance away from the head become extremely low from our observation.

The appearance of the gully erosion temporally coincides with rainfall events in the warm season, accompanied by a rapid increase of soil moisture. Based on the observations of precipitation and soil moisture, we deduce that the gully walls collapsed in the rainfall events, in 2008, 1) 19:32 12/June-02:23 13/June in local time (total 14.6 mm), or 2) 11:18 29/June-00:11 30/June (18.2 mm); in 2009, 17:44 27/July-20:26 27/July (12.8 mm), respectively. In 2010, the rainfall event resulting in the gully extension is considered to be 1) 19:59 02/Aug.-3:12 03/Aug. (18.4 mm, 2.49 mm/hr) or 2) 05:12 07/Aug.-11:12 07/Aug.(39.6 mm, 6.61 mm/hr).

In each year, the almost first rainfall event in the warm season attaining approximately 10 mm in total or more, led to the collapse and retreat of gully walls at one time. Thawing seasonal permafrost possibly has relationship with the lowering ground intensity, and further studies including this are necessary.

Keywords: Land Condition, Gully Erosion, Sheetwash, Rainfall Event, Inner Mongolia

Livelihood Change and Resource Use in Agro-silvo-fishery Settlements around Lake Victoria, Western Kenya

UEDA, Gen^{1*}, Matheaus Kioko Kauti²

¹Graduate School of Environmental Studies, Tohoku University, ²South Eastern University College, University of Nairobi

This study aims at illuminating the extent of environmental change driven by livelihood diversification and resource use, and identifying factors that influence livelihood security of households in agro-silvo-fishery settlements around Lake Victoria, Western Kenya, in the context of a new resource co-management regime introduced in the 2000s that may impact on resource access and livelihood strategies of the people. The following is a discussion based on a preliminary field research in Sindu and its environs, the former Suba District, Nyanza Province. A sample of 59 households was obtained from different zones to examine how resource use is different according to the distance from the lake shore. Contrary to some expectations set by the existing literature, farming households located in the interior zones were increasingly separated from fishing, possibly due to overfishing and the general shift from inshore to offshore fisheries, and to the increasing fishing cost: only those with sufficient capital can go offshore to fish. The livelihood options for the people may become less than before, with the consequence of their increasing vulnerability to various economic shocks. In contrast to the case of fishing, resources in the forest reserve adjacent to their settlements were widely used for firewood and fodder regardless of the zones from the lake shore. This was with no communal nor co-management except occasional community policing, facing environmental degradation. Natural resource use and livelihood diversification/security in the research area are also to be examined taking into account the co-management system since, once operational on a greater scale, it may restrict the resource access of the interior people when the aquatic resources are restored and firewood are used again for local processing of fish.

Keywords: Resource use, Livelihood diversification, Lake Victoria, Kenya