

3.4 Open Seminar / 公開セミナー

Topic of Open Seminar (Date)

Name of Speaker

Occupation of Speaker

Summary of Open Seminar

1. Aiming to Realize the Reconciliation between Nature Conservation and Livelihood Promotion – The Case of Participatory Forest Management Project in Belete-Gera Forest, Ethiopia (27, 28 MAY 2011)

Tsutomu NISHIMURA

Specialist, Japan International Cooperation Agency

1. Why is Participatory Forest Management (PFM) crucial to conserve and effectively utilize the forest and forest resources by local people in a sustainable manner?

The local people have been and will be the main actors in managing and/or deciding the future of forest resources in the Belete-Gera Regional Forest Priority Area (RFPA). They have been traditionally collecting non-timber forest products such as coffee, honey and spices growing under the forest canopy. However, there was no legal mechanism that would encourage participation of local communities in managing forest resources and sharing benefits from the resources. Compared to other forest areas of the country, it has been noted that the Belete-Gera RFPA has been kept in a better condition. The secret behind appears to be that people living in and around the area are being benefited from the forests, especially harvest of wild coffee and honey. People have traditionally kept the forests in order to generate better income than converting them into agricultural lands. In light of rapid destruction of forest areas including some areas of the Belete-Gera RFPA, the regional government of Oromia has adopted a participatory forest management strategy to safeguard the remaining forests from depletion and issued a new proclamation to foster the strategy by recognizing traditional forest resource use rights of local communities.

2. How does biodiversity conservation contribute in improving livelihoods of local communities under the framework of Participatory Forest Management?

It is crucial that PFM is implemented along with a livelihoods-support programme to provide the means to sustain livelihoods of community members who live in and use forests. PFM will not be effective, nor will forest communities be motivated if PFM fails to bring economic benefits to forest users or channel opportunities to generate income. It is important that PFM provides concerned stakeholders with a framework that promotes sustainable forest management, and also that such a framework be supported by sustainable activities, which in turn uphold the framework. For the project to achieve forest conservation, it is necessary therefore not only to establish Forest Management Associations (WaBuB), but also to support forest-asset value-adding activities, while providing opportunities to improve the livelihoods of target communities. This combination - establishing WaBuBs with a livelihood improvement programme - is the bases of the project strategy. Furthermore, the project addresses the importance of local organization in

sustaining both the framework and livelihood improvement activities.

Concerning the issues stated above, the study session will address how the project attempted to realize the reconciliation between nature conservation and livelihood promotion, explaining 3 main project activities i) establishment of WaBuB, ii) improvement of food security and diversification of land use through WaBuB Field School, and iii) development of pro-WaBuB business partnership under WaBuB Forest Coffee Certification Programme, and clarifying how those 3 components are interrelated to meet the project goal.

2. Asian dust source change deduced from radioactive Cs/Sr isotopic ratios contained in the Kosa transported over Japan and those in the continental surface soil (27 SEP. 2011)

Yasuhito IGARASHI

Meteorological Research Institute

By using the anthropogenic radionuclides (AR), which originally from the global fallout, as tracer, the expansion of the Asian dust source-region during the 2000s was investigated. In order to obtain information on recent Asian dust source change (geographical expansion), surface soil was collected in Mongolia, where could be one of the current dust source regions. So that comprehensive analysis of anthropogenic radionuclides in the surface soil in eastern and southern Mongolia was carried out to understand the dust source change. Map of climatic rainfall (CR) in Mongolia was created to know about the relation between the AR in the soil and CR. The goal of the present study was set as if the shift of the Asian dust source region be accompanied by the degradation of the steppe zone (grassland).

The anthropogenic radionuclides concentrations and their ratio in the Mongolian surface soil at each sampling site exhibited dependence on the climatological annual rainfall. The atmospheric depositions observed in Tsukuba, Japan during recent springs tended to exhibit the AR characteristics of those surface soils from steppe zone. It was thus verified that the recent shift of the Asian dust source was characterized as the degradation of steppe zone by use of the present chemical tracer. It is possible to use anthropogenic radionuclides as proxy of climate change in the aeolian dust source region. The analysis of silt-size fraction of the Mongolian surface soil should be continued to further verify the Asian dust source change. Coupling with other tracer study could offer more insight for the topic.

3. Mesquite invasion and land degradation in Sudan (13 OCT 2011)

As an activity of Grant Project by JSPS, 'Relationship between exclusive invasion of alien plant and heterogeneity of subsurface hydrology in arid environment', International Symposium is held. Main topics are mesquite intrusion and land degradation. To the symposium, 6 of lecturer come from Sudan for the presentation. 5 are from Japan. The presentations cover, ecology, biology, remote sensing, agriculture, sociology, and others.

The title of presentations is:

Status of desertification research in Sudan: Al-Rawakeeb Research Station.

An overview of research on water resources management under dryland conditions: Experience of DRI, NCR, Sudan.

Comparison between Mesquite invasion to agricultural land and control of desert creeping in Sudan

Performance of Mesquite and some Acacia species under drought conditions: Future plan

Analysis of climate conditions and their impact on water resources in Sudan

Understanding the mesquite issues at the village level in Sudan: To combat a negative heritage of "combating desertification"

Water uptake of Mesquite: research outlines & Experimental results.

Invasion strategic of mesquite (*Prosopis juliflora*) in arid and semi-arid Africa.

Evaluation of the response of Mesquite seedlings to dry conditions.

Inter-action between mesquite and groundwater.

In addition to the above presentation, the following topics are discussed.

Observation planning at wadi area in Sudan (Dr. Hiroshi Yasuda)

Mesquite water uptake: Multi-disciplinary approach (Dr. Kiyotsugu Yoda)

Landscape effects on Mesquite water uptake pattern (Dr. Mohamed A. M. Abd Elbasit)

4. The trend of sap flow measurement and its application for the landscape studies (25 NOV 2011)

Shinichi TAKEUCHI

Faculty of Environmental, Minami Kyusyu University

1. Sap flow measurement

Typical sap flow measurements widely apply for herbaceous plants and woody plants were reviewed. The steady state heat balance method and the heat pulse method were investigated for good agreement with transpiration obtained by the gravimetric method.

2. Sap flow workshop 8th in Italy

The speaker participated sap flow workshop 8th in May 2010. In this workshop, five invited speaker gave the lecture as follows, Theoretical developments towards a new method to measure low and reverse flows (S.Green), Sap flow response to the plant water stress (E.Fernandez), The radial and zimuthal (or tangential) distribution of sap velocity in tree stems (S.Cohen), Improvement of sap flow methodology and it's a non traditional way including relationship to tree structure (J. Cermak) and Redistribution of water in soil and tree compartment (N.Nadezhdina) . These contents were introduced and discussed.

3. Application of sap flow measurement in real time soil moisture management and Examination for supplemental irrigation using automatic drip system under high atmospheric demand

An automatic irrigation system based on sap flow rate measured by the heat pulse method was developed and examined for sweet pepper cultivation with drip irrigation. The irrigation criteria for the irrigation system utilized the sap flow rate itself. When accumulated sap flow rates reached certain values, the same amount of irrigation was executed with 40ml/minutes intensity. In this study, 3 irrigation plots, 1liter, 3liter, 4.5liter, were examined for sweet pepper and compared with a general automatic irrigation system based on soil moisture monitoring, determined by soil moisture sensor. The benefits of an irrigation technique based on actual sap flow rate as employed in this study were confirmed because the total information about plant canopy and structure under ground related to water consumption is included.

The automatic drip irrigation system based on soil moisture measurement has a tendency to decrease in crop transpiration under high atmospheric demand. Two approaches to avoid this decrease were investigated; one approach is based on the location of drip points and the other approach is applying supplemental irrigation in several ways. Measurements of solar radiation were combined to control the additional watering for high evaporative conditions. These automatic irrigation systems were carefully examined for sweet pepper cultivation with sap flow rate. The supplemental irrigation system adopted in this study has good practical results without significant reduction in transpiration due to water stress.

4. Sap Flow Movement on Magnolia Grandiflora Root Measured by the Heat Ratio Method

We measured sap flow of tree trunk and large-diameter root for the subject of *Magnolia Grandiflora* under the premise of transplant. The change of water movement attribute in the body of tree was comprehended with the tree transplant operation that is initiated from preliminary operations such as pruning work and digging around the tree root. The compensation heat pulse method was applied to the trunk and the improved heat pulse method, termed the heat ratio method (HRM) was also applied to the sap flow measurement for prop root that is exposed on the ground surface. The long-term sap flow speed indicated the maximum value at the end of July as 5 months passed after girdling execution, and then it was decreased gradually. The operation would be determined as success or failure by comprehending sap flow before/after digging around the tree root and the HRM method was determined as a useful tool at the time because it could detect the stream with low flow speed and easy to use.

5. Mechanisms of environmental tolerance in millets (5 DEC. 2011)

Asana MATSUURA

Assoc. Professor, Faculty of Agriculture of Tokai University

Global food production will need to increase by 38% by 2023 and 57% by 2050 (Wild, 2003) if food supply to the growing world population in to be maintained at current levels. Salinization is the accumulation of water-soluble salts in the soil to a level that impacts on agricultural production. In Japan, temporal salinization has occurred because of typhoon or earthquake. If we want to grow crops in the saline field, salts should be removed and salt tolerant crops are needed.

Millets are C₄ plants that are environmental stress tolerant crops rather than C₃ plants. Millets have a lot of useful element that is help to keep human health, were contained in seeds. However, responses to environmental stress of millets are little understood.

Brachiaria ramose, *Echinichloa frumentacea*, *Setaria italic*, *Setaria glauca*, *Panicum miliaceum*, and *Panicum sumatrense* were used and cultivated with nutrient solution including NaCl as 200 mM or only

nutrient solution till harvest.

Grain yield under salinity is *Brachiaria ramosa* > *Echinochloa frumentacea* > *Panicum miliaceum* > *Setaria glauca* > *Panicum sumatrense* > *Setaria italica*. Salt tolerance of millets is based on ① Total dry weight (Plant growth), ② Normal development of reproductive organ (Yield component), ③ Water uptake (Root growth), ④ Small Na uptake and accumulation in stem (Ion selectivity in root) and ⑤ Chlorophyll has salt tolerance.

I visited Loess Plateau in China on Oct. 29 to Nov. 1st in 2010 and on Sep. 5 to Sep. 10 in 2011. Millets have cultivated in drought and salinity area around 5000 years in China. Millets were growing at Loess Plateau in China, however, less grain yield was observed when it was compared to those in Japan.

In conclusion, millets are very interested crops to increase food in drought and salinity area. Further research is needed to clear the mechanisms of salt tolerance. Grain yield should be increased by introducing new variety and /or new culture methods.

6. Principle and Application of Measurement of Soil Moisture using TDR (15 DEC. 2011)

Jiro CHIKUSHI

Director of Biotron Application Center, Kyusyu University

7. Greening the Desert: Studies With Oats and Super-absorbent Polymers (12 JAN. 2012)

A. Egrinya ENEJI

Professor of Agronomy, Department of Soil Science, Faculty of Agriculture, Forestry & Wildlife Resources Management, University of Calabar, Nigeria

Underground water pollution associated with nitrate leaching has become a major concern in areas with intensive cereal production and in areas with dry climates, water scarcity is the main limitation to crop production. We thus hypothesize that use of super absorbent polymers (SAP) may effectively increase nitrogen use efficiency by minimizing leaching and enhancing water retention in soils. Here, we evaluated nitrate movement in soils amended with SAP and determined changes in maize growth based on enzyme activities and physiological parameters. Nitrate retention was studied in six undisturbed soil lysimeters (35 cm in diameter and 150 cm in depth) under different fertilizer (standard, medium or 75% and low, or 50 % of standard fertilizer rate) with or without SAP. Maize yield decreased 20% under medium and 38% under low fertilizer rate but SAP application increased yield ($P < 0.05$) by 44% under medium fertilizer level and 80% under low fertilizer level. Use of SAP at 30 kg/ha plus only half the amount of standard fertilizer rate (150 kg urea, and 33 kg each of superphosphate and potassium sulfate) minimized nitrate leaching and enhanced uptake with little change in yield relative to the standard fertilizer rate. On the evaluation of SAP at three irrigation levels (adequate, moderate and deficit), we found that the relative water content (RWC) and leaf water potential (ψ_1) were much higher in plants treated with SAP and under deficit irrigation, the SAP increased maize biomass by 99% compared with only 11% under adequate irrigation and 39% under moderate irrigation. Plants treated with SAP under deficit irrigation showed reduced stress signals as noted in the levels of superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), ascorbate peroxidase (APX) and glutathione reductase (GR) activities in leaves. The improved growth of maize treated with SAP under deficit irrigation was ascribed to maintenance of higher RWC, intercellular carbon dioxide concentration and net photosynthetic rates.

8. (17 JAN. 2012)

(1) Legacies of Past Environmental Change, Recent Significant Climate and Social Events in Sahara-Sahel Region, with reference to Mail

Hiroshi KADOMURA

Professor emeritus, Tokyo Metropolitan University

1) Since ca. 2.8 Ma ago, the Sahara-Sahel boundary shifted N-S direction in response to polar glacier variations at an order of 500-1,000 km. In Mali, during the Last Glacial Maximum cold arid period at ca. 21 Ka BP, mobile sand dunes and sheets extended as far south as the Seno Plain at ca. 14°N. In contrast, during the Holocene warm humid (Green Sahara) period at 9-6 Ka BP, Sahelian savanna landscape extended to the north, and there were a lot of fresh water lakes both in inter-dune and structural depressions of hyper-arid Taoudenni Basin. The major tributaries of the Niger, such as Telemsi and Azouak extended deep into the desert. The deposits derived from these changes have played crucial role as dust storm sources, substrata for supporting vegetation and rain-fed cropping, etc. With a backdrop of these and more longer term earth history, the GGWSSI1), a recently initiated ambitious AU-EU Joint “anti-desertification” project, is reviewed in light of the spatial heterogeneity in landscape, groundwater availability, and vulnerability/resiliency to current DLDD2) issues.

2) With the progress of global climate change, the Sahara-Sahel Region has experienced increased heavy rains and floods, including those of unprecedented magnitudes, as exemplified by rainy season in 2007, 2009, 2010 and 2011. In spite of increase in such diluvial events, the Sahel has repeatedly experienced severe drought and food insecurity, because of late onset and/or early cease of rains, and irregular precipitation, as evidenced in 2009 and 2011. During the 2010 lean season, more than 10 million people were at risk of severe food shortage, coupled with rising cereal price.

Massive food insecurity and global acute malnutrition are also anticipated for the coming 2012 lean season in the Sahel including some portions of Mali. Brief comments are made of 2011 flood events in Mali, and also of “*Sahelian Paradox*” observed in the recent storm runoff events.

3) Arab Spring, democratic uprisings spread across the Arab world in 2011, including those of the Saharan countries starting from the Tunisian Revolution have had tremendous effects on human security and livelihood activities not only in the concerned Saharan countries but also in the Sahelian countries. Among others, the impacts of the Libyan Crisis on Chad, Niger, and Mali, who have been obliged to receive massive returnees of emigrants to Libya, those including military men and mercenaries who fought for Cornel Gaddafi, are most grave; in terms of food insecurity, socio-economic reintegration, and the stop of remittances. In Mali, risk from renewed Tuareg rebellion has been anticipated in the Kidal and adjacent areas, since the return of Tuareg warriors.

Mention should be made of recent kidnapping events in the Niger Bend areas of Mali, possibly by the attack of AQIM3), and general insecurity in the Sahara-Sahel Region.

1) Great Green Wall (Grand Muraille Verte) for the Sahel and the Sahara Initiative

2) Desertification, Land Degradation and Drought

3) Al-Qaeda in the Islamic Maghreb

(2) The Study of prevention for desertification in the South Region of Segou in the Republic of MALI

Ryuzo NISHIMAKI

Visiting Professor, Tokyo University of Agriculture

This Study was implemented by Japan International Cooperation Agency (JICA) in close cooperation with the Republic of Mali from 2000 to 2008. The objectives of the Study are (1) to formulate Master plan concerned integrated rural development and prevent the desertification through verification study works (2) to carry out technology transfer to the counterpart personnel in the course of the Study.

Desertification mainly results from over exploitation of natural resources due to the human activities in the arid and semi arid land. The main factor contributing to desertification is villagers themselves and the progress of desertification, in turn, has a further negative influence upon their life. Prevention of desertification will not become sustainable unless villagers recognize this fact and participate in activities for the prevention as a body. From this point of view, participatory approach is set as a priority item in laying down the master plan of the Study for sustainable development in this Region.

The total area of this region is 226,000ha and there are 1,159 villages. In the phase 1 stage (2000-2003), JICA study team selected 12 villages and conducted integrated verification study based on Terroir Management which is a method of promoting the residents' participation. In the phase 2 (2004-2008), 59 verification study works were carried out. The experience of the verification study was reflected to the Master plan in which the Terroir Management Method would be planned to promote to other villages by the Government of Mali.

9. Tibetan Plateau as a climatic interception where Asian monsoon meets dry landscape in the subtropics (2 MAR. 2012)

Kenichi UENO

University of Tsukuba

Tibet-Himalayan regions provide unique land-atmosphere interactions over semi-arid landscape under Asia monsoon climate. Thermo-dynamical functions of the elevated plateau control not only the local weather variability but also glacier/water resources and causes natural disasters in the surrounding countries. Based on the long-term field experiments since GEWEX/GAME project, systematic processes of land-atmosphere interactions are introduced, especially for the modification of precipitation system in the intra-seasonal timescale.

10. (28 MAR. 2012)

(1) Micromorphological Characterization of Steppe Soil in Mongolia

Kenji TAMURA

Assoc. Professor, University of Tsukuba

Soil distribution in Mongolia from north to south changes in line with the following longitudinal zonal schema: (1) mountain taiga zone with cryomorphic taiga soils; (2) mountain forest-steppe zone with Chernozems, dark Kastanozems, forest darkcolored soils, and derno taiga soils; (3) dry-steppe zone

with Kastanozems; (4) semidesert zone with brown semidesert soils; and (5) desert zone with gray-brown desert soil and extra-arid desert “borzon” soils (Dorzhtogov 2003). Dorzhtogov (2003) also showed that the horizontal vegetation–soil sequence is represented in particular in the central plain of Mongolia, with widely distributed Kastanozems in the steppe area, and brown semidesert soil in the semidesert to desert area. I introduce our micromorphological studies on the Mongolian steppe soils in this seminar.

We selected three study areas each in Hustai National Park (HNP), which is located about 100 km southwest of Ulaanbaatar, Kherlen Bayaan-Ulaan (KBU) in Kherlen River basin and Zuunburen located in Selenge River basin. The study sites were located in grasslands, abandoned fields and croplands.

Soil thin sections were made as described by Nagatsuka and Tamura (1986). Undisturbed core samples were impregnated with polyester resin with impregnation apparatus for soil samples. Soil thin section description was carried out as described in the handbook for soil thin section description (Bullock et al., 1985). Thin sections were observed using by a polarization microscope.

The micromorphology of the soil in the steppe region in Mongolia was characterized by the presence of a mollic horizon. There were many macro-aggregates, especially crumbs and granules in A horizon under the undisturbed grasslands. On the other hand, single grain structure was dominated under the cropland and the abandoned fields. This suggests that cultivation in the field would affect destruction of soil microstructure.

(2) Quantity of soil organic matter associated with different particle size fractions in Eurasian steppe

Takashi KANDA

University of Tsukuba

Soil organic matter (SOM) consists of various functional pools that are stabilized by specific mechanisms. For the development of our understanding about soil organic matter dynamics, it is necessary for these pools to be quantified and characterized. Especially, Mineral-associated OM is thus a quantitatively important pool of OM (Basile-Doelsch et al., 2007). A number of studies have demonstrated the significance of minerals such as clay content, metal oxides, clay mineralogy and polyvalent cations in the preservation of SOM. However, despite studies of different fields being continued in different areas of the steppes, relatively little is known about the soil organic matter and minerals in such a large-scale covering the whole Eurasian steppe. Objects of this study were made to improve understanding of relation of SOM to mineral phases on Eurasian steppe soils. Furthermore, particle size fractionation was performed to elucidate the distribution of organic matter into pools supposedly different in structure and function and the importance of specific mineral fractions for carbon storage.

The soil organic carbon (SOC) associated with clay + silt fraction accounted for 79-105% of the total SOC. Clay and silt fractions played a key role in retaining SOC in Eurasian steppe. There were positive correlation between the proportion of either clay or clay + silt fractions and the SOC associated with these fractions. But, there was no significant change in mineralogy among the soils investigated. SOC content of clay or clay + silt fractions and pyrophosphate extractable Fe, Al and Ca were positively correlated. The content of pyrophosphate extractable Ca was larger than pyrophosphate extractable Fe and Al. Consequently, the amount of SOC associated with clay and silt particles is mainly affected by soil texture and Ca content.

公開セミナー

1. 「自然資源保全・管理」と「住民の生計向上」の両立を目指してー「エチオピア国バレ・ゲラ参加型森林計画」の事例研究ー (2011年5月27・28日)
西村 勉 (JICA 専門家)
2. 日本に飛来した黄砂と現地表土中の放射性 Cs/Sr 同位体比解析から推定した黄砂発生源変動 (2011年9月27日)
五十嵐 康人 (気象研究所)
3. スーダンにおける土壌劣化と外来侵入植種メスキートについて (2011年10月13日)
4. 最近の茎内流計測の動向と造園分野への応用 (2011年11月25日)
竹内 真一 (南九州大学環境園芸学科)
5. 雑穀の環境ストレス耐性機構の解析 (2011年12月5日)
松浦 朝奈 (東海大学農学部応用植物科学科准教授)
6. TDRによる水分計測の原理と応用 (2011年12月15日)
筑紫 二郎 (九州大学生物環境調節センター長)
7. Greening the Desert: studies With Oats and Super-absorbent Polymers (2012年1月12日)
A. Egrinya Eneji (Professor of Agronomy, Department of Soil Science, Faculty of Agriculture, Forestry & Wildlife Resources Management, University of Calabar, Nigeria)
8. (2012年1月17日)
 - (1) サハラーサヘル地域における環境先導の遺産と近年の顕著な気候・社会イベントーマリを中心にー
門村 博 (東京都立大学名誉教授)
 - (2) マリ共和国セグー地域南部における砂漠化防止
西牧 隆壯 (東京農業大学客員教授)
9. チベット高原ー亜熱帯地域におけるモンスーンと乾燥域の交差点ー (2012年3月2日)
上野 健一 (筑波大学生命環境系)
10. (2012年3月28日)
 - (1) モンゴル国ステップ土壌の微細形態学的特徴について
田村 憲司 (筑波大学大学院生命環境科学研究科准教授)
 - (2) ユーラシア大陸ステップの異なる粒径サイズごとの土壌有機物の存在量
神田 隆志 (筑波大学大学院生命環境科学研究科 博士課程3年生)