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. Community participation and facilitator -based on the case of the state of Chiapas- (28 MAY 2010)

Sayako WADA
Specialist, Japan International Cooperation Agency

2. Plant growth regulated by auxin and gibberellins, and the role of cell walls (26 NOV. 2010)

Eiichi TANIMOTO
Emeritus Professor, Nagoya City University

3. Climate change investigations for Lake Pichhola, Udaipur (India) (15 DEC 2010)

Chandra S.P. OJHA
Professor, Indian Institute of Technology

Lake Pichola is a very famous lake in India. It is located in Udaipur, a city, known for tourist attraction. Lake Pichola is the back bone of the economy of the region and lake catchment is in a semi-arid region. For the last few decades, the storage in the lake is on a continuous decline and this has raised a concern in Indian Parliament. Through a research project sponsored by Ministry of Water Resources in India, speaker has done a series of investigations to see if the climate change is a real cause for the decline in lake water storage. Water balance computations which account for precise estimates of evaporation using FAO methodology are coupled with trend analysis for precipitation. Also, estimates of water loss through eutrophication are coupled with lake sedimentation to assess the drying of lake. The lecture will provide a detailed investigation into hydrological processes with more emphasis on estimating evaporation using FAO procedure. Also, it will focus on assessment of anthropogenic activities. The lecture will also provide a new insight to assess climate change under similar situations.

4. The effects of a fluctuation of a groundwater level on a soil environment (22 DEC 2010)

Kei NAKAGAWA
Assoc. Professor, Kagoshima University

In order to examine the effects of plant water use on groundwater and soil in the arid environment, laboratory column experiment were performed. Filling up the column with a soil: mixed the volcanic ash soil with dune sand. We adopted *Epipremnum aureum* as a plant which we use for the experiment. The

column was sufficiently flushed with tap water before the start of the experiment. The vegetation was planted on the soil surface and then the mixed solution which mimicked saline groundwater was applied as a start of the experiment. The experiment conducted for a week. According to the vertical profile of cation and anion in the liquid and solid phases, soil column was clearly affected by the groundwater which infiltrated up to the central depth of the column. From the distribution of adsorbed cation, Na^+ was adsorbed and Mg^{2+} was desorbed at the lower part of the column, because relatively large amount of Na^+ was added in the modeled groundwater. From the distribution of adsorbed anion, almost same amounts of SO_4^{2-} and Cl^- were adsorbed. Anion exchange reaction may not be occurred. Since the relatively high concentration of Cl^- in the modeled groundwater, SO_4^{2-} strongly adsorbed.

5. Numerical analysis of coupled water, vapor and heat transport in the vadose zone using HYDRUS (18 JAN. 2010)

Hirotaka SAITO

Assoc. Professor, Tokyo University of Agriculture & Technology

Simultaneous movement of water, vapor and heat in the vadose zone of arid or semi-arid regions is of great interest in evaluating water and energy balance of subsurface environments. Vapor movement may dominate the water movement in these regions because soil moisture near the soil surface is usually very low. Although it is well known that water and/or vapor flow and heat transport processes are closely coupled and strongly affect each other, their simultaneous interactions is rarely considered. In this presentation, the analyses of coupled movement of water, vapor, and heat in the subsurface, as well as interactions of these subsurface processes with the mass and energy balance at the soil surface using the modified HYDRUS-1D program are demonstrated. Movement of both liquid water and water vapor in the subsurface can be driven by either the pressure head (isothermal transport) or temperature (thermal transport) gradients. The heat transport module considers movement of soil heat by (a) conduction, (b) convection of sensible heat by water flow, (c) transfer of latent heat by diffusion of water vapor, and (d) transfer of sensible heat by diffusion of water vapor. Simultaneous water flow and heat transport are coupled not only in the subsurface but also by the surface boundary conditions. The surface water and energy balance significantly affects the subsequent water, vapor, and heat transport in the subsurface. The code allows a very flexible way of using various meteorological data (daily, hourly, other time intervals) at the soil-atmosphere interface for evaluating surface water and energy balance. The coupled model is evaluated using field soil temperature and water content data from different depths. The results show that simulated temperatures and water contents closely agreed with measured values.

6. Drought tolerance of temperate grasses cultivated in Hokkaido. (26 JAN. 2010)

Hideki OKAMOTO

Reseacher, Kamikawa Experiment Station, Hokkaido Research Organization

Grassland-based dairy farming is one of the most important industries in the Tenpoku region of Hokkaido (northern Hokkaido), Japan. Although the climate in Tenpoku is the humid sub-arctic type, this region sometimes experiences a drought in the growing season, which imposes water stress on forage

plants. For instance, in 2005, no rainfall occurred for 37 days from mid-June to the end of July, despite that the air temperatures were favorable to plant growth. Accordingly, grasses in this region need to have high levels of productivity, regrowth and persistency under drought conditions.

The objective of this study was to evaluate the drought response of the four grasses under non-heat-stressed conditions. We evaluated the effects of soil moisture deficit and subsequent watering at low temperature on the productivity and growth of *Bromus inermis* Leyss., *Dactylis glomerata* L., *Lolium perenne* L., and *Phleum pratense* L. by analyzing physiological and morphological traits. Plantlets grown in pot were exposed to dry soil conditions at cool air temperature (5 to 20) for 40 days (the "drought phase") and thereafter to wet soil conditions (the "recovery phase").

D. glomerata was the most susceptible to drought in the drought phase, although dry treatment did not greatly affect its regrowth in the recovery phase, implying that the damage was limited to the drought phase. Moreover, it accumulated oligosaccharides in herbage and non-structural carbohydrates in stubble. *B. inermis* was least affected by dry treatment, but the herbage yield was the lowest. Dry treatment impaired the growth of *L. perenne*, but the grass showed high compensatory growth in the recovery phase, and this species showed relatively high tolerance to drought under low temperature conditions. *L. perenne* also accumulated oligosaccharides in herbage and non-structural carbohydrates in stubble, and some minerals in herbage and stubble. *P. pratense* was less damaged in drought phase than other species, but the previous water stress seriously impaired the regrowth in the regrowth phase. From these results, we can hypothesize that *D. glomerata* has high dehydration postponement ability, *B. inermis* has high dehydration tolerance ability, *L. perenne* has high dehydration recovery ability, and *P. pratense* shows its least drought tolerance among these species.

7. Changes in the monsoon-related climate with a “past and future” lens (16 FEB. 2011)

Hiroaki UEDA
Assoc. Professor, University of Tsukuba

I will introduce a physical interpretation of the semi-arid climate in terms of “monsoon-desert mechanism (Rodwell and Hoskins, 1996, Wang et al. 2010)” and try to apply it to the future projections. Comparison with past warmer climate such as green Africa in the Pliocene (3 million years ago) is also made to enhance credibility of future projections (Kamae and Ueda, 2011; submitted to JMSJ). In a CO_2-rich climate, the monsoonal precipitation will increase, while the circulation itself tends to be attenuated, showing “wind-precipitation paradox”. This discrepancy can be explained by modulation of the driving force of the monsoon, namely reduction of meridional thermal gradient (MTG) between the Asiatic landmass and adjacent tropical oceans (Ueda et al. 2006). Discussion of the MTG changes in a cold climate such as the last glacial maximum allow us to understand the controlling factors for the monsoon intensity, implicating that warm and cold climate are not simple mirror image (Ueda et al. 2010; Clim Dyn).

8. Role of vegetation in the earth climate system (18 FEB. 2011)

Tetsuzo YASUNARI
Professor, Hydrospheric Atomospheric Research Center

In the present presentation, I will review recent observational and modeling studies on the roles of land–atmosphere interactions in the earth climate system. I particularly focus on the role of vegetation in the Eurasian climate in the past, present and future. Based on some observational studies I discuss how land surface changes associated with deforestation and land use/cover change (LUCC) in this region has induced hydro-climate changes through feedback processes of moisture convergence and in- situ evapotranspiration. I also will argue that the amount of moisture amount near the surface, as well as in the atmospheric boundary layer via evapotranspiration, plays a critical role in inducing positive feedback for precipitation change both in the tropics and boreal region. Based on some climate models (GCMs) experiments, I will argue that vegetation could be an important factor in the penetration of precipitation far into the continental interior. Dense vegetation (i.e., forest) has been found to play an essential role in forming a moist monsoon climate across continental areas. In addition, a preliminary result will be shown on a possible another impact of LUCC on climate through changes of atmospheric aerosols forcing (via the biogenic Volatile Organic Compounds (B-VOCs) changes) by using a chemistry-climate model.

As a conclusion, these observational and modeling studies strongly suggest that the continental-scale vegetation coverage in the Eurasian continent is not simply a response to the climate, but also is likely an active player in forming and maintaining the climate itself, including the monsoon and dry climate in Eurasia.

9. Environmental background to current natural resources management issues in the Sahara – Sahel region, with reference to "Great green wall for the Sahara and the Sahel initiative (GGWSSI)" and "Save the Lake Chad Project" – A review from Africa environemnt change study perspective (4 MAR. 2011)

Hiroshi KADOMURA
Emeritus Professor, Tokyo Metropolitan University

"GGWSSI" and "Save the Lake Chad Project" are the two Africa-led, giant natural resources management projects that initiated recently at the southern margin of the Sahara. With the backdrop of the Late-Quaternary and recent environmental history of this region, project designs and problems inherent in these close-related projects are overlooked and briefly reviewed.

1) This region has experienced drastic changes in climate and environmental conditions, even in the last 20,000 years: During the last Glacial Aridity centered at ca. 20,000 yr BP, the southern margin of the Sahara shifted southwards by 400-500 km, and the Chad and other lakes completely dried-up, leaving a belt of "fossil sand dunes and sheets" in the present Sahel Zone.
2) In contrast, during the Post-Glacial warning at 12,000-5,000 yr BP, drastically increased rainfall, including currently hyper-arid Central Sahara, produced "Green Sahara", with the expansion of numerous lakes, including Lake Chad that attained the water area of ca. 340,000 km^2 and the maximum depth of >173 m (Megachad) from 8,500-6,300 cal yr BP (Leblanc et al. 2006), leading to spillover the lake water to the Atlantic through the Niger River system.

3) After ca. 5,000 yr BP, southward march of the Sahara, and the shrinkage and drying up of lakes took place in response to progressive aridification, leaving diatomite and other fine-grained lacustrine deposits within Bodélé, Taoudenni, and other depressions.
4) During the historical times, the Sahel has repeatedly experienced severe drought periods. More recently, persistent drought in the later half of the 20th century, centered at 1984, which accompanied southward shift of the 150 mm/y isohyet ("potential desertification front") by 300-400 km, was most remarkable. However, there was no evidence of the overall desert spreading, although localized remobilization of fossil sand dunes was observed everywhere.
5) Lake Chad has shown dramatic shrinkage since mid-1960s due to coupled effects of persistent drought conditions, and inadequate management of land and water resources in its catchment area. Among others, the construction of Maga Dam of SEMRY II Project in North Cameroon that caused rapid drying up the Waza-Logone Floodplain should be highlighted as a typical example, with its successful rehabilitation works.

Comments on the "GGWSSI" will focus on questions of its detailed design, in view of above environmental background, and special heterogeneity both in terrestrial and socio-economic conditions. For the "Save the Lake Chad Project", comments will center on environmental/ ecological effects of the Oubangui-Chari Inter-Basin Water Transfer Project in the both basins.

10. (7 MAR. 2011)

(1) Allelopathic effect of switchgrass and its chemical basis

YongQing MA

Professor, Institute of Soil and Water Conservation, CAS

Switchgrass (*Panicum virgatum* L.) is a perennial warm season high yield forage grass, which is originated from North American. It has a wide adaptability to barren soil, flood and drought conditions. Some cultivar is also very well adapted to acidic soil. In addition, switchgrass is recognized as the excellent bioenergy plant. And it is a best material for development of bioethanol. Professor Nobumasa Ichizen had conducted research on rehabilitation of the loess plateau from 1988. He had introduced 20000 plant species from all over the world. The results turns out that only switchgrass could be able to adopt to the loess plateau climate conditions. In the meanwhile it also has the ability for protect soil erosion. However, there is no research on different cultivars and different chromosome ploidy switchgrass adaptability and its competition as well as allelopathy effect on the local plant species in the loess plateau. In this study the research on nine different chromosome ploidy and different ecotypes switchgrass with different grow stage's allelopathic effect on the local plant species in the loess plateau were conducted by using bioassay and comprehensive analysis. The results indicated that alkaloids in switchgrass is the major allelochemicals to perennial ryegrass

(2) Induction *Orobanche* seeds germination by switchgrass (*Panicum virgatum* L.) at different grow periods

YongQing MA
Professor, Institute of Soil and Water Conservation, CAS

O. cumana poses a problem in sunflower fields and has resulted in severe yield losses in Xinjiang, Jilin, Hebei and Shanxi provinces. Generally speaking, sunflowers are planted in harsh environments with dry and less fertile soil. In such regions, switchgrass can grow well. In this study, rhizosphere soil, root and aerial tissue extracts of nine cultivars of switchgrass (Alamo, Blackwell, Cave-in-Rock, Forestberg, Illinois USA, Kanlow, Nebraska 28, Pathfinder, Sunburst) were subjected to stimulation of *Orobanche* (*O. minor*, *O. cumana*, *O. acgyptiaca*) seed germination. These cultivars, which induce high *Orobanche* seed germination rates, were able to act as "trap crops" to control *Orobanche* weed proliferation. Results indicated that switchgrass was not able to stimulate *O. minor* seeds to germinate, but can induce *O. cumana* and *O. acgyptiaca* seed germination. The maximum germination rate (58.7%) of *O. cumana* seeds occurred in the presence of *cv*. Forestberg. Likewise, *cv*. Switchgrass rhizosphere soil after growth for 42 days could induce *O. cumana* seed germination, and *cv*. Pathfinder induced a germination rate of 43.7%. In the initial stage (growth of 21 days), the roots and aerial tissue extracts of switchgrass showed potential to induce *O. acgyptiaca* seed germination.

11. (14 MAR. 2011)

(1) Current condition and issue for wet meadow rice production in Ethiopia

Michio NARUOKA
Japan International Research Center for Agricultural Sciences

In this lecture, I based on JIRCAS study in the wet meadow areas around Lake Tana located in the northwestern part of Ethiopia. I report the present state of rice cultivation in the study area. And I explain on rice production issues and solutions in Ethiopia.

To summarize the contents of the lecture, to help increase rice production in the study area is "To increase the productivity of land, " "To introduce the high productivity technique, " "To increase the rice production farmers, " "To reinforce the technical extension, " is require.

In order to improve these issues, farm land consolidation, improved farming techniques, breeding, and strengthen of agricultural extension officers training is needed.

(2) Agriculture in the West Bank, Palestinian National Authority

Masae SUMIKOSHI
Japan International Cooperation Agency

The Palestinian agriculture based on the project for Strengthening Support System Focusing on Sustainable Agriculture in the Jordan River Rift Valley under JICA technical cooperation in the West Bank, Palestinian National Authority is reported in this lecture. The JICA project started its activities in Jericho and Jordan River Rift Valley in March, 2007 until March 2010 with the aim of establishing a basis for the

effective agricultural extension system through direct linkage between research and extension. The project covered various activities requiring participation of the stakeholders under the instruction of JICA Expert Team in order to attain the project objectives, though which mutual understanding and linkage were established and consolidated.

The Palestinian agriculture is considerably interacted and influenced by Israeli agriculture. In parallel with the JICA project in Palestinian National Authority, another activity of JICA project in Israel is also introduced in this lecture. JICA Palestine Office has implemented two trilateral agriculture cooperation projects between Israel, Jordan and Japan, and between Israel, Egypt and Japan in order to contribute to a confidence building in this region.

12. Metabolic engineering, molecular breeding and international collaborations on *Jatropha curcas* (16 MAR. 2011)

Kinya AKASHI
Nara Institute of Science and Technology (NAIST)

During the last several years, the increasing emissions of greenhouse gasses and the shrinking supply of fossil fuel have enhanced various efforts to explore and utilize alternative energy sources, such as biofuels. Among potential biofuel plants, *Jatropha curcas* has been regarded as one of the promising energy crops, for its high oil productivity and drought-resistance in the marginal lands. However, massive investment on the commercial productions of Jatropha in the world has often resulted in the unsatisfactory consequences in the last couple of years, due to the low oil productivity in the dry conditions, as well as the unavailability of suitable germlines for a given climate in which they are planted. Researchers, agronomists and investors are now realizing that the basic research on breeding and farming methods are needed, to establish an efficient and profitable production of *Jatropha*.

To explore and utilize the potential of *Jatropha* as a next-generation biofuel crop, Nara Institute of Science and Technology, in collaboration with Ryukyu University and Riken Plant Science Center, have been working on the R&D of *Jatropha*. A large-scale transcriptome analysis was performed on the change of gene expression during fruit development, which revealed the stage-specific regulations of key metabolic genes during triglyceride biosynthesis. A protocol for the regeneration and stable transformation was established, and *Jatropha* transformants with engineered metabolic pathways were generated in our laboratory. In collaboration with oversea partners such as Bogor Agricultural University in Indonesia, and Department of Agricultural Research in Botswana, Africa, we set out to examine the *Jatropha* germplasms in their country for the selection of elite lines, as well as the research for the optimization of farming methods in each climate. In this seminar, I would like to present our recent activities and future perspectives on the Jatropha research and development.

公開セミナー

１．住民参加とファシリテーター ～チアパスの事例をもとに～ （2010 年 5 月 28 日）
和田　彩矢子 （JICA 専門家）

２．オーキシンとジベレリンによる植物の成長制御と細胞壁の役割　（2010 年 11 月 26 日）
谷本　英一（名古屋市立大学名誉教授）

３．Climate Change Investigations for Lake Pichhola, Udaipur (India)　（2010 年 12 月 15 日）
Chandra S.P. OJHA (Indian Institute of Technology 教授)

４．地下水位の上昇・下降が土壌に及ぼす影響についての一考察　（2010 年 12 月 22 日）
中川　啓（鹿児島大学農学部准教授）

５．HYDRUS を用いた土中液状水・水蒸気・熱移動解析　（2011 年 1 月 18 日）
斎藤　広隆（東京農工大学大学院共生科学技術研究院特任准教授）

６．北海道の寒地型牧草における耐乾性　（2011 年 1 月 26 日）
岡元　英樹（（独）北海道立総合研究機構農業研究本部上川農業試験場天北支場）

７．モンスーンに関係した気候の変化 ～過去と将来の視点から～　（2011 年 2 月 16 日）
植田　宏昭（筑波大学准教授）

８．地球気候における植生の役割 －ユーラシア大陸を中心に－　（2011 年 2 月 18 日）
安成　哲三（名古屋大学地球水循環研究センター准教授）

９．サハラーサヘル地域における現在の自然資源管理問題の環境史背景－「サハラ・サヘル第緑壁イニシアティブ（GGWSSI）」と「チャド湖を救え計画」をめぐって
－アフリカ環境変動研究の視点からのレビュー－　（2011 年 3 月 4 日）
門村　浩（東京都立大学名誉教授）

１０．（2011 年 3 月 7 日）
（１）Allelopathic effect of switchgrass and its chemical basis
（２）Induction *Orobanche* seeds germination by Switchgrass (*Panicum virgatum* L.) at different grow periods
馬　永清（中国・中国科学院水土保持研究所教授）

１１．（2011 年 3 月 14 日）
（１）エチオピアの内陸低湿地帯における稲作の現状と課題
成岡　道男（国際農林水産業研究センター）
（２）パレスチナ自治政府ヨルダン川西岸地区における農業の現状と課題
隅越　昌枝（国際協力機構）

１２．ヤトロファの代謝制御・遺伝子工学と、アジア・アフリカとの国際共同研究開発
（2011 年 3 月 16 日）
明石　欣也（奈良先端科学技術大学院大学）