(3) Summary of Open Seminar

Topic of Open Seminar (Date)
Name of Speaker
Occupation of Speaker
Summary of Open Seminar

1) Studies on Water-Saving Cultivation of Crops in Arid Lands

Ion Channels and a Water Channel in Relation to Salt Tolerance (June 29, 1999)

Maki KATSUHARA

Research Institute for Bioresources, Okayama University

Ion transport, the potassium channel and apoptosis phenomenon were introduced in relation to salt tolerance. The potassium channel usually passes sodium also. A genetic modification was tried on barley potassium channel gene and as the results, salt tolerance was observed to be improved by allowing less sodium to come in. Apoptosis phenomenon was observed during the process of root cell damage by high concentrations of salt. Its possible significance was discussed.

Introduction of Salt Tolerant Genes (Chromatin) from Wild Relatives into Wheat Genome (June 29, 1999)

Wen Ye YUAN

Faculty of Agriculture, Tottori University

Salt tolerant genes were tried to be introduced through interspecific hybridization between wheat grass, *Agropyron elongatum*, and common wheat, *Triticum aestivum*. A salt tolerant line, W148, was obtained. It has been used as a breeding material and the chromatin section carrying salt tolerance is examined through GISH, Genomic In-situ Hybridization method.

Making Transgenic Plants for Salt Tolerance
– A Scavenger against Active Oxygen and a Synthesizer of Trehalose – (June 29, 1999)

Kiyoshi TANAKA

Faculty of Agriculture, Tottori University

Since compatible solutes and scavengers against active oxygen species were considered to be major factors controlling salt tolerance, genetic manipulation was tried to introduce genes from different organisms. Trehalose synthesizing enzyme was tried to be introduced. The transgenic plants produced increased amount of trehalose. GR, Glutathione reductase, gene was introduced to tobacco plants. Transgenic plants showed improved salt tolerance.

2) Study on Reclamation of Arid Land Soil Using Liming Material (Aug. 10, 1999)

Yoshitaka NITTA
Yokkaichi University

3) Study on Energy for Agriculture (Aug. 13, 1999)

Osamu KITANI
College of Bioresource Sciences, Nihon University

4) Global Warming and Tundra Soil
- Spatial Distribution of Active Layer on Hillslope in Siberian Tundra - (Nov. 18, 1999)

Masaru MIZOGUCHI
The University of Tokyo

Permafrost region is a good sensor for monitoring global warming because frozen soil thaws at the temperature over 0 degree. In addition, thawing process of the frozen soil is important in global energy and water cycle experiment (GEWEX). Due to such reasons, GAME (GEWEX Asia Monsoon Experiment) project is being carried out for these years. In this seminar, I would like to talk about the outline of the project and a new finding obtained from the field study in Siberian tundra soil.

Spatial distribution of active layer thickness (thaw depth) influences on the hydrological processes in permafrost region. We have observed the active layer thickness on a 100 m x 100 m hill-slope grid set in tundra region during the summer of 1998. The collected thickness data was analyzed for the relationship to the topographic features as well as the vegetation cover. The semi-variogram analysis revealed that there were the anisotropy and the periodicity in the active layer thickness. In the present paper, we will discuss that the anisotropy and the periodicity may come from tundra polygon and solifraction that are generally observed in the tundra region.

5) Water Utilization in Upland Fields
Advection in Cultivated Fields and its Effect on Consumptive Use of Water (October 26, 1999)

Yoshisuke NAKANO
Faculty of Agriculture, Kyusyu University

Water Movement and Redistribution
in Soil-Plant-Atmosphere-Continuum (SPAC) (October 26, 1999)

Tetsuo SAKURATANI
Graduate School of Agriculture, Kyoto University

6) Development and Utilization of Plastics Made from Fermented Soybean, " Nattoh"(Nov. 5, 1999)

Toshio HARA
Faculty of Agriculture, Kyushu University

Decomposable plastics with high water holding capacity was developed from the sticky liquid around fermented soybean (Nattoh) grains. It seems highly feasible to use the material as a water holding substance to improve irrigation efficiency in dry lands since it gives no negative impact by decomposing in the soil.

7) Global Hydrological Cycle and the Role of Rivers (December 2, 1999)

Taikan OKI
Institute of Industrial Science, the University of Tokyo

The concept, data, results, and application of atmospheric water balance for the investigation of hydrological cycle in the global scale were introduced. For the validation and the global assessment of total water storage in major river basins, the river discharge dataset was also developed and utilized. To examine the role of rivers in the global hydrological cycles, global river channel network and a simple river routing model were formed in addition to the river discharge dataset. From the results of these comprehensive investigations, it was clearly showed that rivers plays not negligible role in the global hydrological cycle quantitatively as well as qualitatively. The three components of these digital river system, namely, the discharge data, river flow information, and the routing scheme was also applied for the validation studies of energy and water balances estimated by various land surface models (LSMs) under the global soil wetness project (GSWP). It was found that the correspondences between observed and simulated annual runoff were poor where the given precipitation forcing to the LSMs were derived from poor density of source raingauge data. It was also found most of the LSMs tend to underestimate the annual runoff in the higher latitudes. However, in general, the estimated soil moisture distributions by GSWP-pilot phase were validated to give better boundary conditions to GCMS estimating precipitation in mid-latitudes. Finally, future direction of the research in the field of land surface hydrology as well as ecology was discussed, and particularly the necessity of modeling the growth of vegetation and the interactions between natural water and human activities are stressed.

8) Soil-Water Measurement by TDR in (Highly) Saline Soils (December 9, 1999)

Md. A. MOJID
Faculty of Agriculture, Saga University

TDR is now a popular technique for simultaneous and non-destructive measurement of water content and bulk electrical conductivity of soil. However, TDR over-estimates water content in saline soils and in highly saline soils excessive attenuation of the signal makes TDR measurement impossible. For accurate measurement of water content in saline soils a correction is needed for the effect of salinity. Incorporation of the electromagnetic theory of wave propagation in disperse/lossy medium with TDR theory can make this correction. An insulated sensor reduces the energy loss in highly saline soils and maintains considerable energy and shape of the signal. An additional calibration of the sensor is needed for the effect of the insulation. The insulated sensor extends TDR measurements in highly saline soils.

9) Local Communities and Forests in Semi-Arid Regions

Land Systems and Forest Resources in Guinea Savanna:
A Case Study of Nupeland, Northern Nigeria (Jan. 21, 2000)

Misa MASUDA
Institute of Agriculture and Forestry, University of Tsukuba

One of the characteristics widely found in West Africa is that traditional social and political systems had been preserved and sometimes enhanced under the indirect rule of colonial period. The indigenous authorities still retain their control over land and people, which forms a dual structure, though the postwar process of modernization and commercialization is in progress.

In regard to forest resources, they are divided to those enclosed as forest reserves and the others that remain outside reserves. As compared with a uniformed management system applied to forest reserves, forests outside reserves are still controlled by customary land systems.

This report first defines the term of land system as the whole of land tenure and utilization, and then explains the current situation of trees outside forest reserves through a case of Nupe community located in the southern part of Niger state. What can be suggested from the results for international corporation strategies are: trees outside reserves also play an important role since the area of forest reserves accounts for only 9.8% of the country including national parks, but since the customary systems vary from place to place, it is necessary to apply carefully thought out measures for conservation.

Global Efforts toward International Sustainable Forest Management (Jan. 21, 2000)

Yoshimitsu NISHITANI
International Forestry Cooperation Office, Forestry Agency, Ministry of Agriculture, Forestry and Fishery

The idea and concept of Sustainable Forest Management (SFM) was adopted at UNCED in 1992. Since then, international communities have paid efforts to identify the components of SFM and implement program of works to attain SFM in each country.

Through these efforts, some approaches to SFM have started in national, regional, and international level, which are as following:

1. International dialogue identified the underlying causes of forest degradation and deforestation and adopted the program of action for SFM.
2. Criteria and Indicators are new approach commenced by regional initiatives to monitor forest management and feed the output back to the forest policy.
3. Certification and labeling are being introduced into international community through private sector initiatives such as FSC and ISO.

In addition to the above trend, international dialogues are still going on to discuss on the future arrangements and mechanism of international coordination to SFM. Furthermore, another discussion is going on to take carbon sequestration by forests into account in order to attain the target of the greenhouse gas emission reduction of the countries.

10) Some Topics on the Study of Paddy Soil Special Attention on the Large Scale Paddy Field (Feb. 25, 2000)

Kazunobu TORIYAMA
Hokuriku National Agricultural Experiment Station

Recently, many small-scale paddy fields are reclaimed to become large scale paddy fields in Japan. Although there is the scale merit for farm work, unevenness of soil fertility due to land reclamation is often pointed out. New method of management for large-scale paddy filed has being developed at Hokuriku NAES, that is the site specific management system for rice production. The system is consisted of three sub-systems, those are sensing system, mapping system and appropriate control system by the use of mapped data of the field. Soil fertility map is made by using NlRS (Near Infra Red Spectroscopy) analyzer on the soil core sampled by the new soil sampling machine developed by our experiment station. Sensed data of the rice plant can be mapped simultaneously by using GPS (Global Positioning System). The new mapping system is called GBMS (Grand Base Mapping System) also the new invention of our own. The amount of nitrogen fertilizer to adjust the nitrogen fertility unevenness can be calculated by the concept of optimum nitrogen absorption pattern of the rice plant for specific yield level. The field trial for these site specific management system is now undertaken. So far, top soil (fertile soil layer) thickness contribute significantly to the nitrogen map of the paddy field. It means that the two dimensional soil fertility map of the plow layer soil is not enough, the important point is to indicate the soil fertility by area basis.

Soil Erosion Prediction for Farmland Conservation (Feb. 25, 2000)

Kingshuk ROY
College of Bioresource Sciences, Nihon University

To estimate the amount of eroded soil from farmlands is an important pre-criterion for selecting proper soil conservation measures. In Japan, an equation for estimating soil loss from water erosion due to rainfall and runoff had been proposed by a researcher based on a series of laboratory and field experiments done over the years at the Faculty of Agric., Yamaguchi Univ. This equation is of a practical type which considers the growth of vegetation and the pattern and intensity of rainfall. The present report focuses the results of the study as well as the process of investigating the rate of applicability of the equation in different types of fields (bare and vegetative). For the study, several crops had been cultivated in different experimental plots within the university campus. Then, 2-years observations had been carried out on soil loss and surface runoff in each cropping plot. With the measured values of soil loss in each field at different growing-stages compared, an attempt is made to determine the constant values of two unknown coefficients for each crop. The equation in question has further been revised to be an extended form, which considers the effect of small quantity of rainfall with the intensity of 1mm$\leqq$/10min, and the effect of lateral width of a field. With this newly developed equation, investigation has been made into soil loss in each cropping-plot of the experimental fields under rainfall both natural and artificial, and into the applicability-rate of the equation. The results obtained from using the effect of small rainfall and the lateral width of slope in that the applicability-rate proceeding from the equation shows higher values than from the basic form of the equation. Finally, the values of each coefficient and exponent of the soil loss equation have been categorized according to the types of the crops.

11) Introduction to Salinity Problems in Arid Regions (Feb. 28, 2000)

Seiichi MIYAMOTO
Agricultural Research Center at El Paso, Texas A&M University

12) Salinity Management in Arid Regions (Feb. 29, 2000)

Seiichi MIYAMOTO
Agricultural Research Center at El Paso, Texas A&M University

13) Utilization of Remote Sensing Data for Arid Land Research

Modern Trends in Application of Remote Sensing Data (March 3, 2000)

Yoshiaki HONDA
Center for Environmental Remote Sensing, Chiba University

Revision of Satellite Image Recognition (March 3, 2000)

Toshiaki HASHIMOTO
Center for Environmental Remote Sensing, Chiba University

Measurement of three-Dimensional Structure of Plant using 3D-Scanner (March 3, 2000)

Yasuji KAJIWARA
Center for Environmental Remote Sensing, Chiba University

Agricultural Use of Remote Sensing Data (March 3, 2000)

Motoya SAITOU
National Institute of Agro-Environmental Sciences
The Ministry of Agriculture, Forestry and Fisheries of Japan

14) Development and Use of Natural Energy in Arid Land Areas

Modern Approach on Utilization of Natural Energy (March 6, 2000)

Makio KAMICHIKA
Arid Land Research Center, Tottori University

Earth Environment Problems and Generation of Electricity by Wind Power (March 6, 2000)

Tsutomu HAYASHI
Faculty of Engineering, Tottori University

A Point of View for Application of New Natural Energy in Arid Land Areas (March 6, 2000)

Yoshiharu TAKADA
Applied Weather Engineering Co., Tokyo

15) Agriculture in Sudan (March 8, 2000)

Azhari Abdelazim HAMADA
Center for Research on Wild Plants, Utsunomiya University

Sudan with an area of 2.5 million km^2 is the largest country in Africa. Agriculture is the backbone of Sudan's economy where it provides livelihood for about 80% of the population (estimated at 30 million) and accounts for over 80% of the exports. The total contribution of agriculture to Gross Domestic Product (GDP) is about 33.4% {irrigated sector (12.4%), rain-fed sector (7.3%), livestock (10.9%) and others (2.8%)}. Agriculture provides food for the people, raw material for industry, and commodities for export. However, Sudan imports most of the agricultural inputs including fertilizers, pesticides and machineries. With its fertile soil, different climatical regions and abundance of natural resources, Sudan has been supposed to be the breadbasket of the Arab World.

Major topographical features of the country are the Nile River, its headstreams the White Nile and Blue Nile, and the tributaries of these rivers (Annual discharge of the Nile River water is about 85.6×10^9 m^3). Currently, Sudan is using between 15-16$\times10^9$ m^3/year of water for irrigation compared with its allocation of 18.5×10^9 m^3/year under the 1959 Nile Water Agreement with Egypt. Other sources of water are national surface water (3×10^9 m^3/year) and underground water (13×10^9 m^3/year). Thus the total annual available water is about 34.5×10^9 m^3. The total amount of water used annually is estimated at 18×10^9 m^3. Irrigated agriculture is the major user of water and will continue to be so in the coming decades. Climate of Sudan varies from arid in the Northern region, semi-arid in the Central region and equatorial in the Southern region. Soils vary from sandy in the North to clayey in the Central region, lateritic in the South and alluvial along the Nile River basin.

The country has a huge livestock wealth estimated at 3 million camels, 37 million sheep, 33 million goats and 30 million cows. Forest resources supply 70% of the country's total energy - a fact that should not be overlooked. However, the most important forest crop in the country is Gum Arabic and Sudan produces about 80% of the total world production. Although about 84 million ha of cultivable land is suitable for growing a variety of crops, only 14% (12 million ha) of arable land is utilized for crop and animal production. About 10 million ha are under rain-fed production and 2 million ha are under irrigation. It is planned that one million ha more will eventually be irrigated in near future. The principal crops are sorghum (55.6% of the total cultivated area), millet (21%), sesame (10%), groundnut (3.8%), vegetables and fruits (3.5%), cotton (2.8%), wheat (2%), sugar cane (0.8%), maize and sunflower (0.5%). farmer's crop yield is always 50% lower than the potential yield obtained under research conditions. The low yields in the rain-fed sector could be attributed to low rainfall or bad distribution of rains, use of traditional low yielding crop varieties and weeds particularly *Striga hermonthica*. In the irrigated sector, however,

improper husbandry practices including sowing date, water management and pest control are the major causes.

16) Water Utilization in Upland Fields

Effect of Energy Balance System (March 14, 2000)

Matsuji MATSUDA
Institute for Conservation of Nature, Nagano Prefecture

Studies on the Estimation of Soil Moisture in the Root Zone by Using AMeDAS Data (March 14, 2000)

Keiichi NAKAYAMA
Faculty of Horticulture, Chiba University

The model to estimate soil moisture in the root zone was detailed with the applicability of the model. The model is constructed based on the water balance of the root zone and it is hoped to be a model that can estimate the soil moisture by using only meteorological data such as AMeDAS data in Japanese Meteorological Agency.

The tests of the model performance were conducted on the potato field at Izumi experimental farm in Abashiri district in Hokkaido, the deciduous broad leaved forest in Saitama, and the sand dune in Tottori. The estimated soil moisture was in good agreement with the measured soil moisture when the correcting factor in the actual evapotranspiration equation was determined adequately. However, the heavy rain for the short time in the forest disturbed the estimating of soil moisture. Although the amount of upward capillary flow at the potato field and the forest were more than expected amounts, it was a negligible small at the sand dune.

On the Planning Upland Irrigation (March 14, 2000)

Hiroshi KAWANO
Minami Kyushu Junior College

Such new concepts of the National Planning Standard of Upland Irrigation as moisture reaction coefficient of crop and upward moisture supply from sub-layer were introduced.

Lower limit of available soil moisture, pF3.0 for crop was discussed from the viewpoint of consumptive use of moisture. Such investigated results were explained as raising effective rainfall and effective use of water stored under the root zone, by replacing it from pF3.0 to pF4.2.

The importance of evaluating the soil structure improvement effect was introduced from such functions as water storage, crop nutrition supply, vitality of root and microorganisms.

Actual farming water use at upland fields in Southern Kyushu was introduced. It extended characteristically by reflecting climate conditions and cropping pattern. Water use for soil moisture management exceeded any other purposes in number of use, quantity of water and irrigation area.

17) Drought Tolerance of Cowpea (March 28, 2000)

Tomio TERAO
Hokuriku National Agricultural Experiment Station
The Ministry of Agriculture Forestry and Fisheries of Japan

The summary of studies on drought tolerance of cowpea conducted at IITA, the International Institute of Tropical Agriculture, in Nigeria was presented. One of the characteristics of drought tolerance was the type of root distribution. Tolerant types have less branched roots and longer roots reached to the deeper part of the soil. Recent QTL, quantitative traits loci, analysis on rice was added. Usually the negative correlation between number of grains and fertility is strong enough to be broken out. A promising QTL factor was found on chromosome six which enhances both grain number and fertility.