

### **(3) Summary of Open Seminar**

#### **Topic of Open Seminar (Date)**

*Name of Speaker*

Occupation of Speaker

Summary of Open Seminar

#### **1) The Aeolian Sand Disaster and its Control in the Tarim Desert Highway, Xingjiang, China (May 23,2001)**

*Lei JIAQIANG*

Visiting scientist to Arid Land Research Center, Tottori University  
(Xinjiang Institute of Ecology and Geography, Chinese Academy of Science)

The outline of activities of the Xinjiang Institute of Ecology and Geography was introduced. Xinjiang has 3 series of mountains and 2 basins. Tazhong Oil Field produces 1.8 million tons of oil annually in the Taklimakan desert. A highway connect the northern and the southern parts of Xinjiang with Tazhong in the midway. During April to September, 2.6 m/s winds blows mostly East-north-east direction. Several types of sand dunes distribute along the highway with 1 to 3 m high in average. To prevent the sand to accumulate on the road surface, fence and checkboards are set along the roadside. Monitoring on the shelter system was started in 1997. Sand intruded on the road is cleared by human hands. Ground water exists 1 to 3 m depth. It includes 4 to 5 g/l of salt. Tamarix, Haloxylon and Calligonum were planted successfully for some part of the roadside.

#### **2) Life of People in Tonga —Economy and Culture— (Aug. 24, 2001)**

*Hirotsugu NAKAMOTO*

School for Social - Human Environmentology, Daito Bunka University

Our university is performing academic exchange with the Kingdom of Tonga, and many foreign students from there have also been accepted. The Kingdom of Tonga consists of about 150 islands with total land area of about 750 ? (almost the same size as Tsushima). Total population is about 100,000 occupying regional water area of 720,000 ? (about twice that of Japan). Although the economic development of this country has hoped in marine-resources development and tourism. There is still an excess of imports relative to exports (export : import ratio increased from 1:5 in 1992 to 1993 to 1:6 in 1995 to 1996). It is difficult to stop the brain-drain from the country. However, some of these young talented people can gain knowledge and experience which will benefit their society. The governmental policy is directed towards efficient employment of these people in public and private sectors.

#### **3) Global climates and variability and their potential impacts (Sept. 3, 2001)**

*Daniel HILLELL*

Professor Emeritus, University of Massachusetts

A broad understanding of the potential future with climate change is enhanced by multi-faceted analyses, involving study of both biophysical and socio-economic processes. Population growth and changing economic and technological conditions will interact with changing climate conditions to affect socio-economic and ecological systems. Integrated studies link these realms, and ideally extend to interactions both within and across sectors such as agriculture and its competing demands for water by

industrial and urban users. Climate change will also affect shifting patterns of land use between agricultural and forest (or other less managed) ecosystems. Integrated assessment research at the regional level is now addressing these linkages, and is being extended to simultaneous consideration of adaptation and greenhouse gas mitigation.

#### **4) Recent development in plant water physiology (Nov. 9, 2001)**

##### **Nondestructive Water Imaging in a Living Plant**

*Tomoko NAKANISHI*

Graduate School of Agricultural and Life Sciences, The University of Tokyo

The outline of work on "imaging water in a living plant sample" through neutron beam analysis as well as by positron emitting tracer imaging system (PETIS) was presented.

Though water plays an important role in plant physiology, the water behavior has not been known well because of lacking tools for the research. Although the imaging by X-ray beam is an effective technique to visualize comparatively heavy elements in living samples, the neutron beam has an advantage to detect light elements, such as hydrogen, lithium and boron. When neutron beam is irradiated to plants, hydrogen image is produced, for attenuation efficiency of hydrogen is about 100-1000 times higher compared to those of the other common elements. Since more than 80 % of living organism is consisted of water, an image by neutron beam can be regarded as water image in a living plant. Recently, we have developed neutron beam analysis to get water image in a living plant. This method provides nondestructive water specific image in a plant with high resolution. We are also performing the neutron beam imaging using a cooled CCD camera to construct CT (computer tomography; cross-sectional image) images, and spatial water distribution was analyzed. Though the neutron method showed the static water distribution in a living plant, it was difficult to trace the real-time water movement in a plant tissue. Therefore, we tried PETIS, where the radioactive nuclide emits two gamma-rays, with identical energy, to the 180 degree different angle. When we set a sample between a pair of gamma-ray detector, the position and amount of the labeled water absorbed could be measured. First of all we tried to use <sup>18</sup>F-labeled water (half-life of <sup>18</sup>F: 110min), produced by a cyclotron, to measure real-time water uptake and transport manner in a plant. However, there was always a problem whether tracing an activity from <sup>18</sup>F really indicates water movement itself. Though only a small amount of <sup>18</sup>F was produced from water target, without any carrier of F- ion, the movement of <sup>18</sup>F- ion could be different from that of water itself. To solve this problem the application of <sup>15</sup>O-labeled water was necessary. But because of extremely short half-life of <sup>15</sup>O, only 2min, it was difficult to produce enough amount of tracer and to perform the tracer work. Using the special system developed by one of the author, we could produce sufficient amount of <sup>15</sup>O-water to measure the real time movement of water itself in a soybean plant.

Pictures of water images of plants obtained by neutron beam as well as <sup>15</sup>O-water behavior in a plant by PETIS were presented.

##### **Root Hydrotropism: Mechanisms of the Differential Growth**

*Tadashi HIRASAWA*

Faculty of Agriculture, Tokyo University of Agriculture and Technology

Direction of root elongation would be important for plants to absorb water and minerals from soil. Plant root can detect a moisture (water potential) gradient around them as well as gravity. They grow towards higher moisture (water potential). Mechanisms of the differential growth were examined for the hydrotropic bending of roots of an ageotropic pea mutant, ageotropum. For the root bending hydrotropically in a chamber with a steady humidity gradient, plastic extensibility was higher in the tissues that faced the air with lower humidity than in the tissues that faced the air with higher humidity. No

differences in turgor pressure and yield threshold were observed between the tissues that faced the air with higher and lower humidity. Therefore, the extensibility of the cell wall appeared to be responsible for the different growth rates of tissues in root hydrotropism.

When agar blocks with water potentials of -0.03 and -0.8 MPa were unilaterally applied directly to a root tip, cells in the most rapidly elongating zone showed marked differential growth. The rate of water uptake by a cell on the side treated with an agar block with lower water potential was significantly larger in the outer first and second layers of cortex than on the other side. There were no differences in turgor pressure, osmotic potential and calculated water potential of individual cells on both sides of the elongating and mature zone, indicating the absence of any difference in the growth-induced water potential on the two sides of the root. Hydraulic conductivity ( $L_p$ ) of elongating cells was significantly larger on the side with the agar block with lower water potential. The difference in the rate of water uptake during the differential cell growth that occurs during root hydrotropism might be induced mainly by a change in  $L_p$ .

Probable control mechanisms of the root hydrotropism are discussed.

#### **5) Nitrogen dynamics in the forest ecosystems (Nov. 11, 2001)**

*Naoko TOKUCHI*

Graduate School of Agriculture, Kyoto University

Nitrogen is the one of the essential nutrient for plant and nitrogen is limited in the forest ecosystem. From the nitrogen limitation, there are many mechanisms for the tight nitrogen cycling in the forest ecosystem. One is the high accumulation of organic N. Organic N is inert form for leaching. The nitrogen cycling is dominated by internal organic matter transfers, with major storage occurring in the plants and soil organic matter. The other is the form of inorganic N, ammonium and nitrate. Nitrate is relatively mobile ion comparing to ammonium. The occurrence of nitrification has been of special interest in ecosystem. There is high variability of nitrification in forest soil. The high nitrification variability related with topography, climate and parent materials makes the tight nitrogen cycling within the whole forest ecosystem.

#### **6) Global Climate Change and Rice Productivity (Dec. 5, 2001)**

*Hiroshi NAKAGAWA*

Graduate School of Agriculture, Kyoto University

A simulation model, SIMRIW was presented for predicting the impacts of climate change on rice productivity, after the summation of rice responses to elevated  $CO_2$  concentration and high temperature. Experimental studies suggest that doubling  $CO_2$  concentration increases the biomass of rice by about 25% and also increases yield by similar extents under the current temperature regimes. High temperature conditions at flowering, however, have a possibility to reduce rice yield due to high-temperature-induced spikelet sterility. Simulation studies with SIMRIW and climate scenarios indicate that future climate change may result in substantially increased irrigated rice yields for the northern parts of Japan, and that reductions in rice yields are possible for southern Japan. Mitigation strategy of the negative effects of climate change was also discussed.

**7) Possibilities for Increasing Carbon Dioxide Sequestration Taking Advantage of Scale Merit in a Semi-Arid Ecosystem (Dec. 5, 2001)**

Yoshitaka KAKUBARI

Faculty of Agriculture, Shizuoka University

Research on measures to stop global warming is in urgent need. The concentration of carbon dioxide in the atmosphere increases and air temperature rises. Arresting the progress of warming requires either reduction of exhaust gases or carbon sequestration. The method proposed here for increasing carbon dioxide sequestration in semi-arid ecosystems makes use of natural latent possibilities and wagers on scale merit. Carbon dioxide sequestration developments studies begun using a large scale of afforestation in arid-land, West.-Australia. Subsequent work has provided information on *Eucalyptus camaldulensis* and *Acacia aneura* forests. A modeling framework based on an eco-physiological model integrates detailed information on structure and physiological response taken in the field experiments and observations. Photosynthesis and transpiration measurements under natural conditions will provide validation for carbon dioxide sequestration. The photosynthesis of *Eucalyptus* and *Acacia* was predicted using the relationships photosynthesis rates and light condition, soil moisture contents and leaf water potentials during 2-year-measuring period; i.e. integrated daily net photosynthesis was  $1.3 \mu \text{ mol CO}_2/\text{m}^2$  in *Eucalyptus* and  $0.8 \mu \text{ mol CO}_2/\text{m}^2$  in *Acacia*, respectively. Total net photosynthesis during 18 months in *Eucalyptus* and *Acacia* was 422 and 41  $\text{mol CO}_2/\text{m}^2$ , respectively. *Eucalyptus* is more 10 times greater than that in *Acacia* causing with the differences of the maximum photosynthesis rates and levels of water contents in soil. We plan to drive an arid-land model with the validated model for carbon dioxide sequestration developments by a large scale of afforestation from single leaf model to regional levels. These tools are useful for managing forest production and water yield an arid-land region.

This research project is financed with the Science Technology of Agency (STA) of Japan.

**8) Field Research on the Soil Degradation in Arid Land (Dec. 5, 2001)**

**(A) Soil Degradation, Rehabilitation and Protection in the Philippines**

Clariza B. FLORES

Graduate School of Social and Cultural Studies, Kyushu University

Due to indiscriminate forest cleanings and land conversion to agricultural purposes, the country's once rich in natural resources is now the most endangered. The overzealous extraction brought by poor logging, unchecked illegal logging and cultivation for agriculture purpose at unstoppable rates have caused the rapid denudation of the forest. At present, less than 20 percent of the total land area is covered by vegetation. This scenario has challenged the national government to find and implement appropriate actions towards restoring degraded areas. The Philippines has implemented various rehabilitation programs with the task of employing conservation measures to cater with immediate needs of land transformation through developing more appropriate land-use systems to sustain growing population at the same time improve degraded areas and alleviate deforestation.

**(B) Development of the facilitation method for the local people's participation in West Africa - A case in the study of prevention for desertification in the south region of SEGOU in the republic of MALI -**

*Michio NARUOKA*

Overseas Activities Department, Japan Green Resources Corporation

In the republic of MALI, desertification is spreading out by a suddenly increase in population and an effect of drought. In the country, there is the development survey with the object of prevention for desertification, and an empirically survey which is a part of the development survey is enforced. In this survey, we facilitate using the facilitation method for the local people's participation that (i) to bring about the sense of local peoples the object of prevention for desertification, (ii) to take part in the making various plans and (iii) to manage the undertaking. In this report, we introduce the facilitation method for the local people's participation that we are using in the study of prevention for desertification in the south region of SEGOU in the republic of MALI .

**(C) Life-size scale study on soil degradation and possibility of technical participation: case studies in the Sahel**

*Ueru TANAKA*

Laboratory of Comparative Agricultural Science, Graduate School of Agriculture, Kyoto University

Semi-arid West Africa is one of the front lines of desertification. As a serious aspect of this region, the daily activities of local husbandry for basic human needs accelerate the desertification processes. Study efforts should be done at life-size scale, since desertification is defined as 'human-induced' degradation of land resources and environment. As a premise of taking-action, we have to describe human-soil interactions and, then, to seek the rooms for technical participation adapting to field realities. In the presentation, some basic findings on desertification mechanism, the environment-adaptability of indigenous techniques, and the practical options for preventing desertification and improving life standards of local people were discussed.

1. Soil degradation and human impacts (a case in Mali): Initial sign of desertification appears at soil surface, as a form of sealing. Sealing is affected by the degree of surface undulation and soil disturbance associated with ploughing (newly introduced soil management practice). Decrease of water permeability by sealing causes failure of water-harvesting and drought injury of young crop. Finer soil particles are selectively lost with increased run-off water and the remained sands are blown by wind during dry season. Consequently, the rate of soil loss in the site estimates 8 to 10 mm per year.

2. Fertility maintenance under local husbandry system (a case in Burkina Faso): Major fertility maintenance systems in the Sahel are grass fallow and parcage. In the grass fallow, the above-ground biomass was  $3.3 \pm 2.4$  ton/ha ( $n=4$ ) in October, at the beginning of dry season where grazing pressure was relatively low, and  $1.5 \pm 0.6$  ton/ha ( $n=4$ ) in May after entirely grazed. The latter value is less than 30 % of the above-ground biomass of pearl millet,  $5.8 \pm 2.3$  ton/ha ( $n=5$ ), at harvest. This fact suggests that grass fallow may not maintain soil fertility enough to sustain the crops, because of high grazing pressure. On the other hand, the cultivated field covered with cattle feces under parcage system was  $2.01 \pm 1.54$  ha ( $n=7$ ) with the density of  $2.92 \pm 2.17$  ton/ha. This input may sufficiently support the crop growth.

3. Inherent self-protection of soil against wind erosion and reappraisal of indigenous practice (a case in Burkina Faso): Remarkable characteristic of sandy soils in the Sahel is the multiple structure of thin layers in soil profile. When exposed at surface, the thin layer stops further wind erosion. Indigenous 'no-tillage weeding' in the Sahel minimises the destruction of the thin layers. Thus, the current practice is well suitable to the soil.

4. Horizontal (south-to-south) technology transfer: Some indigenous technologies evolved in semi-arid

tropics are adopted to a given condition and considered as a stock of practical options for combating desertification. In the presentation, one example from semi-arid India to the Sahel was introduced with special interest to the current local soil management system and soil characteristics.

#### **(D) Desertification of farm lands in the southwestern part of Niger and methods for conservation**

*Takanori NAGANO*

Research Institute for Humanity and Nature

A field trial was conducted to quantify water budget of a sloped millet field and to test effect of land conservation techniques in the southwestern part of Niger, West Africa during rainy seasons of 1998 through 2000. A 0.6ha test field was divided into blocks and contour soil ridges were created at different intervals. Water balance elements such as rainfall, surface runoff, evapotranspiration and soil water storage, and plant growth elements were measured. Application of manures or mulching before the onset of the season greatly reduced surface runoff due to attraction of termites to soil surface and breaking down of soil crust as a consequence. Soil ridges harvested concentrated runoffs, however the growth of millet was not enhanced due to excess moisture in the upper part of the ridges. Spatial variability of infiltration had large influence on water budget. The middle to upper slope showed a lower infiltration rate, as a result of erosion history, compared to the higher infiltration rate at down slope with sand accumulation.

While high-infiltration areas consistently had larger water storage every year, the growth of millet there was inferior to that of low-infiltration areas in both the wet and the dry year. In the soil profiles of high-infiltration areas, clay content was relatively lower. Nutrients may have leached in these profiles in the high rainfall years. Conserved low-infiltration areas were more stable in production. Although contour ridges in the tested region did not enhance production by water harvesting, they were effective in stopping surface runoff and conserving coarse sands on the surface. In a long run, improvement of infiltration in the eroded surfaces can be expected. These results suggest that if techniques above are combined and applied to marginal areas, these areas could become more productive and nutritionally stable.

#### **(E) Amelioration of Arid Lands by Adding Natural Humified Materials and Its Importance**

*Yuki YAZAWA*

Department of Industrial Chemistry, Chiba Institute of Technology

It is possible that natural organic materials (NOM) with high contents of humus C achieve such objectives as physicochemical stabilization of arid arable lands. The background of this research have already reported that the increase of agricultural productions became possible with those humified NOMs in the following arid lands (i.e. irrigated land, alkali/salt-affected lands, and acid-affected land) assumed where are difficult to restore as arable land. These ameliorating effects of NOMs are summarized as follows:

- 1) Controlling of soil moisture mobility by the formation of soil aggregation
- 2) Increasing cation exchangeable capacity
- 3) Increasing buffering ability for chemical substances
- 4) Reducing of active levels of toxic monomeric Al

Showing physiological activities similarly to a plant-hormone substance.

So, it is possible that C of resistant plant materials is increased by ameliorating with physicochemically stable humic materials (i.e. peats, weathered coal, and brown coals) in the acid-affected arid lands, and humus C is self-produced by microbial activity in the soil carbon cycling. The build up of soil organic C (SOC) levels will not only act as a sink for atmospheric CO<sub>2</sub> but also increase soil fertility. This is not only advantageous to the industry but it will also lead to larger inputs of organic C into the soil thus promoting higher steady state levels of SOC. It may be possible to introduce more stable, longer-lived

forms of SOC, particularly in deeper levels in the soil profile.

**(F) Measurement of soil properties and water balance analysis in arid land**

*Hiroyuki HAMANO*

Department of applied chemistry, Graduate School of Engineering, Seikei University

The comparison of results of saturated hydraulic conductivity with various measurements was proposed for soil structure estimation. The homogeneity of the soil in the arid area was demonstrated. The main cause of heterogeneous penetration was elucidated. A good correlation between biomass and the time to wilting point estimated by numerical simulation was found.

**(G) Sand movement and dune drifting at the mobile dunes**

*Shuhei OKADA*

Arid Land Research Center, Tottori University

The relationships between sand movement and some associated elements at Tottori Sand Dune and a new method to monitor successive dune drifting were studied.

Annual mean wind velocity around Tottori Sand Dune is decreasing. This is caused by the growth of windbreak forest. The relationship between growth of windbreak forest and wind velocity were shown.

The annual and monthly tendency of sand surface displacement and the regional distribution were shown on the basis of the result of field survey in Tottori Sand Dune. Sand surface displacement was harder than 1992 by the effect of weeding. The tendency of erosion continues from 1992 until 1998.

The qualitative analytical result was explained concerning the relationship among the sand surface displacements, meteorological data and the weeding data. The strong wind occurs sand movement. While precipitation and snow cover protects sand movement. Plant communities induce making accumulated and eroded area, and weeding induces sand movement. These elements bring complex sand movement.

A new method to monitor successive dune drifting by some aerial photographs was studied. The leeward slope of dune topography is scarp and mostly same inclination. It was confirmed that the brightness values of leeward slope differs from the other part in the aerial photograph. The new method utilized this feature was devised to monitor successive dune drifting. The new method is able to analyze the direction and distance of dune drifting.

**(H) Evaluations and Analyses of Human Activities in Asia by Utilizing DMSP data**

*Yasutomi NAKANO\**, *Kan-ichiro MATSUMURA\*\**, *Kiminori GEMBA\**, *Tomoki NAKAYA\*\*\**  
*Toshiaki ICHINOSE\*\*\*\**

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Many of the urban in Asian countries give more priority to economic development than to environmental issues these days, which leads to the serious environmental deterioration. Under those circumstances it is needed to develop the material to measure the levels of economic development and of environmental preservation in order to balance the two. However in urban areas in developing countries, survey of the environment and statistical maintenance are not well established yet, which makes it difficult to collect cross-sectional urban environmental Indicators under common criteria. Another problem is the credibility of those data; many of the existing data are said to be unreliable. Consequently, it is

indispensable to develop a methodology to quantify developing stages of urban areas in Asian countries, or possibly in other cities in the world. Here we propose an alternative method; It is a method to gather information through remote sensing, and process it on the geographic Information intensity and the macroeconomic indicators using nighttime light intensity data measured by one of US Military satellites (DMSP; defense meteorological satellite programs). This study has been made on the premise that economically more dynamic areas show stronger light intensity. The total light amount is defined as the product of light intensity, rated on a scale of 256, and the light surface area.

**9) The present situation of global warming prediction (Feb. 19, 2002)**

*Akimasa SUMI*

Center for Climate System Research, University of Tokyo

**10) Root system formation and physiological activity in maize (*Zeamays L.*)(Feb. 21, 2002)**

*Shigenori MORITA*

Graduate School of Agricultural and Life Science, The University of Tokyo

There is need to measure and evaluate physiological activity of plant roots in order to improve crop production, especially under dry conditions. Most of conventional methods to examine morphology and physiology of plant roots are tedious, time-consuming and destructive. The authors have been trying to use electric potential and capacitance to know biological mass and physiological activity of maize roots, because such parameters can be measured rapidly and non-destructively in field. Although there still remains some problems for actual use of such parameters, it has shown that they have possible relationship to root mass and its physiological activity in maize based on phenology.

**11) Forest declination and acid rain ( Feb.21, 2002)**

*Hideyuki SHIMIZU*

National Institute for Environmental Studies

**12) Measurement of water potential and breeding for insect resistance in beans (Mar. 15, 2002)  
Measurement Techniques for the Growth-induced Water Potential and Growth Control  
under Water Deficit Conditions**

*Hiroshi NONAMI*

Plant Biophysics/Biochemistry Research Laboratory, Ehime University

Water potentials in plant tissue can be measured accurately with psychrometers, and the setups for the isopiestic psychrometer measurement system were shown in detail. The water status of cells can be measured with the pressure probe and a nanoliter osmometer. Measurements of the water status in the cellular level with the pressure probe were compared with measurements of the water status in the tissue level with the psychrometer. Both measurement techniques gave similar results when the mature tissue was used.

The pressure chamber measures the matric potential in plant tissue although it is usually used for the purpose of measurements of water potential. The osmotic potential of the apoplast solution was extracted from the zone of elongation in soybean seedlings by applying pressure in the root zone with the pressure chamber while the root was immersed in water, and the solute concentration in the apoplast was very low. The water potential in the zone of elongation measured with the isopiestic psychrometer in the intact plant was similar to the matric potential measured with the pressure chamber, confirming that the apoplast solution concentration was low.

The cell water potential in the zone of elongation in actively growing soybean seedlings was



measured with the pressure probe and a nanoliter osmometer. It was found that the water potential gradient existed from the xylem to the surrounding elongating cells, and the size of the growth-induced water potential was approximately 0.2 MPa.

When soybean seedlings were transplanted from wet vermiculite to water-deficient vermiculite, the growth was inhibited immediately although turgor of the bulk tissue in the zone of elongation was not changed. When the pressure was applied to the root zone of soybean seedlings transplanted to the water deficient vermiculite, the growth recovery was observed immediately after pressure application. This indicated that water flow from the xylem to the surrounding cells was regulating cell elongation. Therefore, it is concluded that the primary cause of growth inhibition at low water potential is the collapse of the growth-induced water potential so that water cannot flow from the xylem to the surrounding elongating cells.

### **Genetic engineering of two train legumes, soybean and azuki bean**

Masao ISHIMOTO

National Agricultural Research Center for Western Region, MAFF

The tribe Phaseoleae includes such staple grain legumes as soybean (*Glycine max*), common bean (*Phaseolus vulgaris*), cowpea (*Vigna unguiculata*), and mung bean (*V. radiata*), all of which are major protein or oil sources. To understand and improve agronomic traits, classical and molecular genetic studies have been conducted on these leguminous crops. Genomic analysis of soybean, for example, has enabled marker-assisted breeding and map-based cloning for nematode. The difficulties of transformation and plant regeneration in these legumes retard studies on gene function analysis, and most techniques for making transgenic plants are not efficient in small laboratories due to their time-consuming, labor-intensive procedures.

Of the grain legumes so far, azuki bean shows the high ability of regeneration and transformation by the *Agrobacterium* mediated transformation system. Azuki bean epicotyl explants were prepared from etiolated seedlings and co-cultivated with *Agrobacterium tumefaciens* for 2 days. Adventitious shoots were developed from callus of the explants on the regeneration medium containing hygromycin, and the shoots were excised and transferred on the rooting medium containing hygromycin at the same concentration. Rooting shoots were transferred to soil and grown in a glass-house to produce viable seeds. PCR analysis was confirmed clearly the presence of hpt gene in most of the azuki beans regenerated under the hygromycin selection. In order to enhance the insect resistance against bean weevils, we introduced a common bean  $\alpha$ -amylase inhibitor gene into azuki bean.

There is a few transgenic soybeans obtained in Japan so far. So, first we have optimized transformation and regeneration system for soybean according to the described method. Soybean embryogenic suspension culture was generated from immature cotyledons, and used for the introduction of the plasmids by particle bombardment. Hygromycin-resistant embryogenic clones were isolated after 8 weeks hygromycin selection, and then the green clones were matured on the differentiation liquid medium. After the desiccation, embryos germinated on the rooting medium, and the plants were transferred on soil in a glass-house. Approximately, more than 50% of the regenerated soybean plants tolerant to hygromycin yielded the hpt fragment by PCR analysis. To improve seed quality, we introduced a modified Gyl (A1aB1b) proglycinin gene with a synthetic DNA encoding four continuous methionins into soybean embryos via particle bombardment.

### **13) A view of the social problem on protecting the desertification**

**-About the desertification and its factor of Inner Mongolia of china in recent years-(Mar. 20, 2002)**

*Zhou Jian-zhong*

Faculty of Humanities, Tokyo Seitoku University

The desertification is a serious problem in China, especially in recent years, the yellow sand caused Beijing airport to be closed up. And the distance that the liquid desert to reach the capital city is 150km. It is said that the desertification due to human activities, but the activities are conditioned by the social factitious, religions, education, politics, economics, law and so on.

According to the historical analysis, the deals of stock farming of Inner Mongolia are changed into the people's commune, contracting out system, artificially sown pastures construction, sedentary grazing, from nomadic into inhabitant. contracting out system has made stock farmer's producing power highly motivated, but the rapid expansion of production scale have made the desertification at the west area quickly.

We must enforce to make studies and provision for the social factors of the desertification, while promoting the modern deals of stock farming. Enact a law to protect the environment of the grassland, or to change the view of ecology of the innapitants, are the examples of it.

**14) Irrigation planning on the newly reclaimed crop field and some problems confronted  
(Mar. 22, 2002)**

*Yoshisuke NAKANO*

Graduate School of Agriculture, Kyushu University

A big reclamation project for agricultural production is in progress at the Isahaya Bay, Nagasaki Prefecture in Japan. To improve the soil physical properties, a large amount of gypsum was added to the original heavy clay and leaching was conducted for several months using sprinkler. After these treatment crops were planted, but saltish clay still have the probability to damage the crops.

In the presentation, some trials to control the salt damages for crop production were introduced. First, the soil physical improvement processes from the first stage of the reclamation to the present stage was introduced. Second, experimental and numerical studied on the soil water movement and salt movement in the cropped fields was stated. Third, the optimal irrigation scheduling to suppress the upward flow of saltish water in the draught condition was discussed.

**15) Agricultural Economics and Non-economic Factors (Mar. 22, 2002)**

*Hiroshi TSUJI*

Graduate School of Agriculture, Kyoto University

The researches in the field of agricultural economics have conventionally built economic models constructed by economic variables such as production, consumption, stock and its change, international trade, domestic trade, government intervention, factor inputs, and prices, and utilized these models for policy analyses and prescriptions. But non-economic variables such as rainfall, temperature, water resources, soil fertility, other natural resources, environmental conditions, and scenery usually were not explicitly included in the economic models. In the short-run economic analyses many of these variables such as soil fertility, water resources, and other natural resources are assumed to be constant, and rainfall and temperature are considered to be included in the random disturbance term of the economic models. But as population explosion, income growth, and global warming have continued in the developing countries in the arid area on the earth, these non-economic variables cannot anymore be considered to be constant and/or random disturbance terms of the sort-run economic model. In order to cope with this new situation, new long-run multidisciplinary models and approaches that incorporate in them both economic variables and non-economic variables are needed. In this report, two past researches of the reporter constructing new long-run multidisciplinary models and analyzed the interactions among economic and non-economic

variables. One research of the reporter was published as: Hiroshi Tsujii, "Effect of Climatic Fluctuation on Rice Production in Continental Thailand," in K. Takahashi and M. Yoshino eds., *Climatic Change and Food Production*, University of Tokyo Press, pp. 167-79, 1977. This research analyzed the relationships among regional rainfall, hydrological conditions, economic variables and rice production in Thailand. Another research of the reporter was published as: Hiroshi Tsujii with M. M. Yoshino and others, "The Effects of Climatic Variations on Agriculture in Japan," in M. L. Parry, T. R. Carter and N. T. Konjin, eds., *The Impact of Climatic Variations on Agriculture. Volume 1. Assessments in Cool Temperate and Cold Regions, Part VI*, Dordrecht, The Netherlands: Kluwer Academic Publishers, for International Institute of Applied Systems Analysis (IIASA) at Vienna and United Nations Environment Program, pp. 725-863, 1988. This research analyzed the relationships among the warming caused by doubling CO<sub>2</sub>, economic variables, policy variables and rice production in Japan.

Current research of the reporter concerning the problems of sustainable agricultural development and farmers' behavior and economy and national policy in the arid area in Nigeria, Tanzania, Senegal, Turkey, Egypt, Java, Indonesia based on the interview survey of the sedentary and pastoral farmers in these countries are presented emphasizing the case study in the terraced upland crop agroforestry area in the Central Java, Indonesia.